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U. S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
ANIMAL AND POULTRY HUSBANDRY RESEARCH BRANCH
and
COOPERATING WESTERN STATES

W-1 - IMPROVEMENT OF BEEF CATTLE THROUGH THE APPLICATION OF
BREEDING METHODS

1955 Annual Report of W-1

and

Report of

Annual Meeting of Technical Committee

Fort Collins, Colorado

July 13 - 14, 1955

This report is intended for the use of
administrative leaders and workers and
is NOT for general publication.

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ANNUAL MEETING
W-1 Technical Committee
Fort Collins, Colorado
July 13 - 14, 1955

Oliver Wayman, Chairman

Members Present:

Arizona	O. F. Pahnish
California	P. W. Gregory
Colorado	H. H. Stonaker
Hawaii	Oliver Wayman
Idaho	C. F. Sierk
Montana	F. S. Willson
Nevada	J. F. Kidwell
New Mexico	R. L. Blackwell
Oregon	Ralph Bogart
Utah	J. A. Bennett
Washington	M. W. Galgan
Wyoming	P. O. Stratton
U. S. Range Livestock Experiment Station, Miles City, Montana	R. R. Woodward
Regional Administrative Adviser	S. S. Wheeler
Coordinator	R. T. Clark
Agricultural Research Service:	
Animal and Poultry Husbandry Research Branch	T. C. Byerly
Office of Experiment Stations	J. O. Grandstaff

The meeting was called to order at 8:00 A.M., by the Chairman, who greeted the visitors and especially welcomed the Extension Specialists.

Dr. Wayman:

One of the needs of the work has been to get it to the attention of the people--to get it to the producers themselves. Last year it was suggested that the Extension people be invited to attend the 1955 meeting, so they are here with us today.

The first order of business is the reports from the States.

University of Arizona

- I. Station: Arizona Agricultural Experiment Station, Tucson, Arizona.
- II. Project Title: Breeding and Selection of Beef Cattle for the Southwest.
- III. Personnel:
- A. Experiment station personnel:
 - 1. O. F. Pahnish
 - 2. C. B. Roubicek
 - 3. E. B. Stanley
 - 4. C. E. Safley
 - B. Cooperators, Record of Performance Project:
 - 1. Frank S. Boice (Empire Ranch) Sonoita, Arizona.
 - 2. Henry G. Boice (Arivaca Ranch) Arivaca, Arizona.
 - 3. Apache Indian Agency and Apache Tribe, San Carlos, Arizona.
 - 4. State Experiment Stations, Western region.
 - C. Cooperators, Dwarf Research Project:
 - 1. Purebred cattle breeders of Arizona and other western states.
 - 2. Personnel of other state experiment stations, Western region.
 - D. Cooperators. (U. S. Department of Agriculture)
 - 1. R. T. Clark (Coordinator, Western region).
 - 2. U. S. Range Livestock Experiment Station, Miles City, Montana.
- IV. Nature and Extent of Work Done: Record of Performance Program--The cooperative project with the Boice ranches at Sonoita and Arivaca, Arizona, was continued as outlined in previous annual reports. Data accumulated over a period of six years were coded and sent to the office of the Regional Coordinator in Denver to be recorded on IBM cards and prepared for detailed analyses. These data include weaning weights, 18 month weights, conformation and condition scores at weaning time, and conformation and condition scores at 18 months of age. Feedlot performance data, accumulated over a six-year period, also are available for analyses. The feedlot tests, of 180 days in duration, were also designed to permit an evaluation of feedlot performance on the basis of a condition-constant period within the 180-day, time-constant period.

Tentative plans for an expansion of the performance program have been laid. A cooperative arrangement between the Apache Tribe at San Carlos, Arizona, the Arizona Agricultural Experiment Station, and the U. S. Department of Agriculture is involved. As tentatively arranged, the Apache Tribal Herd at San Carlos will be divided at random into approximately ten sire groups in the spring of 1956. Feedlot tested bulls from the U. S. Range Livestock Experiment Station at Miles City, Montana, will be used in about six of these sire groups. Progeny tests on the Miles City bulls, under Southwest conditions, are thus contemplated. Untested bulls, selected by the Apache Tribe from its usual sources of supply, will be assigned to the remaining four lots to provide a comparison.

The following data will be obtained from the San Carlos tests:

1. Birth data
 - a. Weights
 - b. Birth dates
 - c. Identity of sire and dam
2. Weaning, yearling, 18 month, and two-year-old data
 - a. Weights
 - b. Conformation scores
 - c. Condition scores
 - d. Miscellaneous information of a pertinent nature

Dwarf Research

Research data accumulated at the Arizona Station have been published or publications are being prepared. A review of literature pertaining to dwarfism was compiled. (Please see Section VII of this report.)

A search for body measurements that will differentiate the dwarf and normal phenotypes in newborn calves was continued. Measurements were obtained from calves dropped in the Station herd and in a herd comprised of stock purchased from a variety of sources. All animals were from purebred or grade Hereford herds.

The accumulation of data that may contribute to an evaluation of the profilometer technique for the identification of heterozygotes was continued. Progeny tests were used to check profile interpretations.

Nine heterozygous females of Hereford breeding were purchased to enlarge the Station herd used for progeny testing sires.

V. Summary of Progress and Conclusions to Date:

Record of Performance Program

Sufficient data have been accumulated to permit an evaluation of some of the variables encountered in beef cattle selection under Southwestern range conditions. These data have been coded for IBM. Data are now available for a comparison of time-constant and condition-constant feedlot performance tests.

Dwarf Research

The inheritance of a form of dwarfism¹ commonly found in the Hereford breed was studied and the results were published.

1. A series of four breeding tests indicated that the dwarfism is produced by an autosomal recessive gene. The gene has a semi-lethal effect on the recessive homozygote.

¹Dwarfism first described by: Johnson, L. E., G. S. Harshfield, and W. McCone. Dwarfism, an hereditary defect in beef cattle. Jour. Hered. 42:273, (1951).

The breeding history of an experimental herd of dwarf Herefords at the Arizona station has been prepared for publication. The dwarf animals were obtained at weaning ages from a variety of sources.

1. Fifty percent of the animals of each sex died prior to reproduction or developed disorders that rendered them unserviceable. The causes of death and the ages at which death occurred were variable. The maximum ages attained by dwarf males and females were 58 and 61 months, respectively.
2. A relatively high incidence of bloat was noted.
3. The dwarf bulls, in the performance of natural services, were hampered by short stature, lack of muscular coordination, and paunchiness.
4. Although the dwarf females did not always conceive readily, this was primarily true of virgin heifers.
5. Difficult parturitions were characteristic of the aberrant females and usually resulted in the death of the offspring. To reduce calf mortality at birth, Caesarean section may be the desirable method of delivery.

A station bulletin outlining dwarf characteristics in animals of various ages, presenting the mode of inheritance, and outlining possible control measures, is near completion. This bulletin is intended for distribution to interested stockmen.

A review of pertinent literature pertaining to dwarfism in various species, upon its completion, was issued by the U. S. Department of Agriculture and the University of Arizona. Contributions were made by Drs. P. W. Gregory, Ralph Bogart, and P. O. Stratton, of the California, Oregon, and Wyoming Stations, respectively.

The ranges in measurements that showed promise in discriminating between the dwarf and normal phenotypes in newborn calves were not changed by the addition of data over the past year. Measurements of 10 normal calves and one dwarf were added. The measurements of all bull calves, to date, are summarized in Table 1. The measurements of the dwarf and normal fore cannons did not overlap. Measurements of the rear cannon were not as differentiating. The protrusion of the lower jaw (anterior margin of the dental pad to the posterior margin of the incisor teeth on the median line) proved the least discriminating.

VI. Work Planned for the Future:

- A. A continuation of the breeding project conducted in cooperation with the Boices of Sonoita and Arivaca, Arizona.
- B. Analyses of range and feedlot data obtained from the Boice herds over a six-year period.
- C. Establishment of a range cattle performance program on the Apache Indian Reservation at San Carlos, Arizona.
- D. Further accumulation and evaluation of measurements that may distinguish dwarf and normal phenotypes in newborn calves.
- E. Progeny testing of promising Hereford sires to determine the presence or absence of the dwarf gene. A progeny test on a bull from one of the Miles City lines is contemplated in the immediate future.
- F. Profiling of Hereford bulls that can be progeny tested to check the interpretation of the profiles.

TABLE 1.--A Summary of Measurement Data on Normal and Dwarf Bull Calves (Arizona Station).

Measurements ¹	Number Measured		Range		Overlap Range	Measurements in Overlap	
	Normal	Dwarf	Normal	Dwarf		Normal	Dwarf
Protrusion of Lower Jaw	26	9	0.2-1.1	0.6-1.6	0.6-1.1	10	3
Length of Fore Cannon	25	7	13.3-16.0	12.2-13.0	None	None	None
Length of Rear Cannon	33	10	22.5-27.5	20.0-23.0	22.5-23.0	2	4

¹Measurements in centimeters.

VII. Publications and Manuscripts:

Pahnish, O. F. 1954. A look at dwarfism. Arizona Catalog 9:7.

____ E. B. Stanley, and C. E. Safley. 1955. The inheritance
of a dwarf anomaly in beef cattle. J. Anim. Sci. 14:200.

____ E. B. Stanley, and C. E. Safley. The breeding history
of an experimental herd of dwarf beef cattle. J. Anim. Sci. To be
published.

____ E. B. Stanley, C. E. Safley, and C. B. Roubicek. The
cause and control of a dwarf anomaly in beef cattle. Ariz. Agr.
Expt. Sta. Bul. In preparation.

Roubicek, C. B., R. T. Clark, and O. F. Pahnish. 1955. Dwarfism in
beef cattle. Unnumbered U.S.D.A. publication issued by the Office
of the Coordinator of Beef Cattle Breeding Research, Denver, Colo-
rado.

Safley, C. E. 1954. Experiment stations are inbreeding beef cattle.
Arizona Catalog 10:20-21.

____ 1954. Get more beef; simple records can help you pick
out your top producers. Prog. Agr. Ariz. 6(3):3.

____ 1954. We have gained beef type. Now try for efficiency,
too. Arizona Stockman 20(5):42.

Beef Breeding Project Summary

I. Inventory, Record of performance program.

A. Empire Ranch - Sonoita, Arizona

1. Breed - Hereford (Purebred - unregistered).	
2. Bulls (12 mo. of age or over).....	9
3. Cows (2 yrs. of age or over).....	79
4. Heifers, yearlings.....	28
5. Bull calves (est.).....	35
6. Heifer calves (est.).....	35
7. Percentage use for breeding project.....	not calculated ¹
8. Estimated cash value.....	\$23,500

B. Arivaca Ranch - Arivaca, Arizona

1. Breed - Hereford (Purebred - unregistered).	
2. Bulls (12 mo. of age or over).....	8
3. Cows (2 yrs. of age or over).....	77
4. Heifers, yearlings.....	26
5. Bull calves (est.).....	32
6. Heifer calves (est.).....	32
7. Percentage use for breeding project.....	not calculated ¹
8. Estimated cash value.....	\$22,300

II. Inventory, dwarf research program.

A. University of Arizona

1. Heterozygous cows.....	17
2. Dwarf females (2 yrs. or over).....	3
3. Dwarf sires.....	1
4. Dwarf calves.....	10
5. Normal calves from heterozygous cows.....	6
6. Percentage use for breeding project.....	80
7. Estimated cash value.....	\$2,300

III. Young animals on feed during 1954-55.

A. Purebreds (Hereford)

	<u>Individually Fed</u>	<u>Group Fed</u>
Bulls	12	0
Heifers	0	0
Steers	0	0

IV. Additions of land, physical facilities, and equipment during fiscal year 1954-55.

<u>Item</u>	<u>Actual cash value</u>	<u>Percentage use for beef breeding project</u>
Equipment (Chem. lab.)	\$8,000	25

¹The nature of this project precludes an evaluation of percentage use for research.

University of California

- I. Station: Agricultural Experiment Station, Davis, California.
- II. Project Title: Genetic Control of Hereditary Deficiencies in Beef Cattle With Special Emphasis Upon Dwarfism (Project 1451).
- III. Personnel: P. W. Gregory, F. D. Carroll, G. P. Lofgreen, L. M. Julian, W. S. Tyler, L. W. Holm, T. J. Hage, Dorothy S. Sprague, Lucy Kravetsky, Don Toenjes, Dan Smith, and R. T. Clark, coordinator.
- IV. and V. Nature and Extent of Work Done This Year and Summary of Progress and Conclusions to Date:

A. GENETICS

During the past two years several exploratory crosses were made between different morphological types of dwarfs in the experimental herd maintained at the California Station. The F₁ hybrids from these crosses are now being used in specific mating tests to determine the genetic relationship between phenotypically different dwarf types. In addition to the controlled mating tests, certain valuable genetic data are being collected from the field. Some specific genetic relationships have already been established and others are under study. Mating tests prove that:

1. The recessive dwarf gene of Herefords is also present in Angus.
2. On the basis of morphological manifestations it appears that the same gene is of rather common occurrence in Shorthorns, and may also have a low frequency in Holsteins and Guernseys.
3. The segregates from critical mating tests indicate that recessive genetic dwarfs may appear in several distinct recognizable phenotypes and that specific modifying genes may be responsible for those different morphological types.

There is strong evidence from several critical matings made under controlled conditions at the California Station which clearly suggest that there are genes which act as modifiers of the recessive dwarf gene. Thus, it is highly probable that certain dwarf modifiers effect the recessive dwarf genotype (dd) to such an extent that some dwarfs may always be classified as phenotypically normal. There is some evidence that this also may occur in herds of breeders and commercial cattlemen.

The problem of dwarf modifiers complicates progeny testing and the genetic control of dwarfism. The study of dwarf modifiers is well under way.

4. A study of dwarf and non-dwarf dizygotic twins in which there is fetal vascular anastomosis provides evidence that the blood of the non-dwarf does not change the course of development of the genetic dwarf either in fetal or post natal life. If this principle is established, it is of far reaching biological significance. It can account for the failure of young dwarfs to respond to the administration of desiccated thyroid, (Carroll and Gregory, unpublished), and suggests that there may be a deficiency in the tissues of the dwarf which prevents some reaction essential to the growth process.

5. Since the Hilgardia publication profiles on approximately 150 mature horned Hereford bulls that have been proven by progeny tests have been accumulated. The observations in these new bulls are in agreement with the earlier data.
6. Additional progeny tests are accumulating on bulls profiled from 12 to 17 months of age. The numbers now proven are sufficient to provide a fair check to test the efficacy of the theoretical discriminant functions that should be applicable to animals of this age range.
7. During the past five years, weight, body measurements, and profile data have been obtained on a large number of dwarf, heterozygous, and homozygous normal animals covering the period from birth to maturity. These data are now ready for analysis and interpretation.
8. Dr. Goffman, of the Donner Laboratory, is studying specific lipoproteins and other constituents of blood obtained from dwarf and normal cattle from the California experimental herd. The status of these studies should be known within the next few months.
9. Dr. Leuchtenberger, of Western Reserve University, is investigating the Desoxyribose Nucleic Acid, (DNA), content of nuclei of dwarf, heterozygous and homozygous normal animals provided by our experimental herd. A recent letter from her indicates that the results of this test will be summarized at an early date.
10. Professor Franz Schrader and Dr. Sally Hughes-Schrader, of Columbia University, are investigating the cytology of dwarfs, and homozygous normal animals from the California Station Experimental dwarf herd. Since there appears to be a diminution of DNA in dwarfs based upon Dr. Leuchtenberger's studies, the Columbia investigators thought that the bovine material might be favorable for cytological investigations with specific reference to chromosome size.

B. ANATOMICAL EXPRESSION OF BOVINE DWARFISM

During the past year additional specimens of dwarf and phenotypically normal cattle have been added to the collection of the anatomical materials. These specimens have been processed in accordance with the demands of the individual studies under way. The following aspects of the systematic study of the anatomical expression of bovine dwarfism have been initiated or continued. Emphasis is being placed on the conventional "short-headed" dwarf, but other types of dwarfs are being investigated as animals become available.

1. Detailed Measurements of Appendicular Skeletons. A systematic measurement of the major appendicular bones of the skeletons of dwarf, homozygous normal, and heterozygous animals is in progress. This phase of the study is being conducted by W. S. Tyler and will result in a body of data which can be analyzed in three aspects, which will aid in the answer of the questions, "Is bovine dwarfism a proportional dwarfism? If not, what portions of the body are most affected by dwarf conditioning and modifying genes?"

- a. Comparison of dimensions of an individual bone between genetic types.
 - b. Comparison of measurable characteristics of various bones with other members of a limb within each genetic type.
 - c. Comparison of data of a. (above) between genetic types.
2. Histological Study of Confluence of Osseous Centers - Appendicular Skeleton. During the past year histological specimens of the ossification centers and epiphyseal lines of animals of all three genotypes have been obtained and are under study. Eight sections are taken of bones of the appendicular skeleton. It is intended that a complete series of animals ranging from one week to maturity will be studied.
3. Comparison of Muscle Size With Bone Dimensions. Bovine dwarfs of the short-headed variety are usually identifiable at birth. Identification is based on prognathism, and conformation (a third criterion applicable in some instances is discussed below.)

Even though in general dwarfs tend to be smaller at birth, size alone is not a sound diagnostic characteristic. Conformation is a criterion of considerable importance. The newborn animals may appear "overly mature" and excessively blocky. Such descriptions find their anatomical basis on the relative size relationship of the skeletal and muscular systems and it should be possible to quantitate such relations by a comparison of muscle mass and skeletal dimensions. During the past year a program of dissecting free and weighing some twenty individual muscles of each animal coming for anatomical study has been initiated. These weights will be compared to body weight and dimensions of selected bones. It is believed that one of the following situations will be revealed:

- a. That dwarf conditioning genes affect the skeletal system more than the muscular system, thus accounting for the "overly mature" appearance of some dwarf newborns.
 - b. That the dwarf conditioning genes actually increase the size of the muscular system. This consideration appears less likely but may be entertained until critical data prove otherwise.
4. Systematic Measurements of the Skulls of Dwarf, Normal, and Heterozygous Herefords. A series of measurements of the skulls of dwarfs and phenotypically normal animals is being collected. When it has been determined how the skull of the short-headed dwarf deviates from the phenotypically normal, studies will be directed as follows:
- a. Revelation of potential differences in skulls of heterozygous and normal animals.
 - b. Description of changes in polled Herefords. In the past, most of the studies were directed to horned Herefords. Attention will be directed toward polled animals with the possibility that such studies might permit a diagnostic approach to separate dwarf-carrier and dwarf-free individuals in the polled breeds. At present, progeny testing is the only means of diagnosing normal phenotypes with respect to the dwarf gene in polled cattle.

c. Description of skull differences in short versus long-headed dwarfs. At present it is postulated that three divergent features are present in the skulls of short-headed dwarfs. These are:

- (1) Bulging forehead, possibly due to altered brain mass--skull size relation.
- (2) Shortened floor of cranium with resultant altered angle of nuchal surface as compared to long axis of skull. This is due to premature fusion of the spheno-occipital junction (see below).
- (3) Shortened face. This is evidenced by prognathism (1) in life. The long-headed dwarf appears to exhibit change 1 (above) but lacks changes 2 and 3. Thus, two areas of gene action seem to be involved. Such information meets one of the primary aims of this project--the manner in which the dwarf gene or specific modifiers of the dwarf gene modifies basic anatomical structures. During the past year, considerable effort has gone into planning a series of measurements which will quantitate the three changes mentioned above.

5. Premature Closure of Spheno-Occipital Junction in Bovine Dwarfs of the Short-Headed Variety. It has been noted previously that the spheno-occipital joint fuses early in short-headed dwarfs. This phenomenon has been studied further by a series of measurements (above) and histological preparations. It appears that this joint is always closed by the tenth month in short-headed dwarfs. Literature reports state that this junction should not close before the second year. Studies of skulls of phenotypically normal animals (Herefords) have shown the joint to be open in the second year.

Recently, it has been demonstrated that the joint may be closed in the first week of life. This fact is of applied significance since it is of great diagnostic value. Heads are being received from local and out-of-state sources for purposes of diagnosis. This "lesion", when present, definitely established the specimen as a dwarf. Although this lesion is quite variable, there are further suggestions that the character of the ventral aspect of the base of the skull assumes a more mature appearance in the dwarf. These features are being described in a publication now in preparation.

6. Hydrocephalus in Bovine Dwarfs. Elevated cerebrospinal fluid pressure has been reported in bovine dwarfs by other workers, and work at the University of California has shown a tendency toward hydrocephalus in dwarfs. All such evidences are based on the determination of pressure of CSF by tapping the sub-arachnoid space. Detailed dissections of short-headed dwarfs show a tendency toward expansion of the ventricular system of the brain. Thus, internal hydrocephalus may be present and increased pressure of the fluid in the subarachnoid space suggests a tendency toward generalized hydrocephalus.

The lateral ventricles may distend to such a degree that the septum pellucidum is perforated. Plaster-of-paris casts of a lateral ventricle of each specimen dissected has become a routine procedure of this laboratory. Determination of the volumes of such casts, expresses the volumes of the ventricles. One dwarf had a lateral ventricle volume three times that of a mature normal animal.

7. Depression of the Floor of the Neural Canal. It has been determined that the floor of the neural canal is deformed in short-headed dwarfs. The deformity is a depression of the top of the body of each vertebra--apparently due to deficient growth of this portion. The change has been observed in animals ranging from 3 months to 3 years of age--thus, it is persistent with increasing age. These extra spaces are filled with fat--and do not alter the arrangement of the dura mater. The venous foramina, which carry veins from the body of the vertebral to the dural sinuses, are relatively enlarged in the dwarfs.

It appears that the above change is independent of the vertebral changes much discussed, but unpublished by an eastern research group.

8. Assymetry of Frontal Area of Short-Headed Dwarfs. It is often noted that the bulging forehead of the short-headed dwarf is assymetrical. Dissection reveals that this feature is a reflection of non-uniform expansion of the frontal sinuses. This change may be another expression of the face-shortening feature of these animals since the frontal bones develop as the bones of the face (intra-membranous ossification).

C. COMPARISONS OF RADIOGRAMS OF NEW BORN CALVES WITH HEAD PROFILES

Beginning with the 1954 calf crop, radiograms of specific skeletal parts, including the lumbar vertebrae, were made of all calves dropped in the experimental dwarf herd. Dwarfs and homozygous and heterozygous normal genotypes are represented. Similar studies are being made in a few herds in the field.

An attempt will be made to correlate or integrate specific characteristics of radiograms of young calves with the head profile at one year of age or maturity. The primary object is to check the profile method for identifying the different genotypes associated with the dwarf gene against the vertebral patterns that have been reported to be associated with the specific genotypes involved with the dwarf gene.

D. PHYSIOLOGY

1. Urine and Plasma of normal and dwarf cattle are being assayed for steroids according to the paper chromatographic procedure of Bush (1951) and/or Burton, Zaffaroni and Keutmann (1951). The 17-ketosteroid fractions are being determined by the method of Pond (1951). After the steroid excretion pattern is determined in dwarfs by one of a combination of the above methods, it is planned that the patterns be determined after the administration of highly purified adrenocorticotrophic hormone preparations, cortisone and/or hydrocortisone, and desoxycorticosterone.

2. It is further proposed that radio iodine uptake by the dwarf thyroid gland be measured by means of a scintillation counter and that the uptake be compared with I^{131} uptake by normal bovine thyroid glands before and after the administration of adrenocorticotrophic hormone or cortisone.

VI. Work Planned for the Future: The work of the future will be along the general lines of the past. Much of the original research in genetics, anatomy, and physiology has been of an exploratory nature. Now that many of the problems are more clearly defined, most of the investigations will be more specific in nature.

Each of the studies being investigated under the headings of Genetics, Anatomy, Radiology, and Physiology, will be continued as outlined above.

VII. Publications and Manuscripts:

Gregory, P. W. 1954. An analysis of wry calves in California beef herds. J. Anim. Sci. 13:957-958.

_____ and F. D. Carroll. Proof that the recessive dwarf gene of Herefords is also in Aberdeen-Angus. In preparation.

Julian, L. M., W. S. Tyler, T. J. Hage, and P. W. Gregory. Premature closure of the speno-occipital synchondrosis in short-headed bovine dwarfs. In preparation.

Stormont, C. N., P. W. Gregory, and D. A. Petersen. The vascular anastomosis between dwarf and non-dwarf bovine twins. In preparation.

I. Cattle Inventory
A. Purebreds

BEEF BREEDING PROJECT SUMMARY
Fiscal Year 1954-55

State California
Date 1955

Line designation	Heterozygous								
Breed	Hereford								
Station	California								
Bulls (12 mo. or over)	6								
Cows (2 yrs. or over)	22								
Heifers, yearlings	5								
Bull calves	5								
Heifer calves	7								
Percentage use for breeding project	100								
Estimated cash value	7,600								

B. Grades

Line designation	Dwarf								
Hereford, Angus, Breed horn and various	Short-crosses								
Station	California								
Bulls (12 mo. or over)	9								
Cows (2 yrs. or over)	33								
Male calves	8								
Heifer calves	6								
Percentage use for breeding project	100								
Estimated cash value	11,600								

- II. No animals individually fed.
- III. No new additional facilities required.

I. Station: Agricultural Experiment Station, Davis, California.

II. Project Title: Breeding Experiments With Beef Cattle, Project 1216.

III. Personnel: W. C. Rollins (Project Leader), F. D. Carroll, K. C. Green, P. W. Gregory, N. R. Ittner, K. A. Wagon, and R. T. Clark, coordinator.

IV. Nature and Extent of Work Done This Year:

1. To investigate methods of selecting bulls for the transmission of improved rate of gain, economy of gain, earliness of maturity and carcass characteristics.
2. To investigate methods of selecting cows to improve productivity and reproductive fitness.
3. To investigate the value of crossbreeding in improving the adaptability of beef cattle to the summer conditions of high temperature and humidity in the Imperial Valley.

V. Summary of Progress and Conclusions to Date:

Testing bulls directly and by use of progeny for rate of gain, efficiency of gain and earliness of maturity. This experiment is proceeding according to the plan outlined in last year's report. To date five pairs of bulls have been loaned out. The gets of the first pair are being fattened in the feed lot at Davis.

During the year protein-bound-iodine determinations were made on 16 bulls and 66 steers. Blood was collected at the beginning of the fattening period for the determinations and the animals were fed until they reached a slaughter grade of choice. This period varied from about 90 to 130 days. At the end of the feeding period the results were inspected to ascertain whether or not a correlation existed between the protein-bound-iodine content of the blood and the animal's rate of gain or feed efficiency. There seemed to be no correlation whatsoever.

A manuscript is being prepared on the effect of age on P.B.I. Breeding yearling heifers and Growth during the suckling period.

These programs are proceeding as outlined in last year's report.

Phenotypic anomalies

Two phenotypic anomalies have occurred in the linebred herd at Davis:

1. A misshapen head, resulting from a depression of either the right or left temple.
2. A double cervex.

The hypothesis that these defects are due to a recessive autosomal gene is being investigated.

Adaptation of beef cattle to the summer conditions of high temperature and humidity in the Imperial Valley

This experiment is proceeding as outlined in last year's report. Due to space limitations the original plan has been modified so that only steer calves will be put in the feed lot and studied through the carcass stage.

VI. RESULTS

Imperial Valley

The 1953 calf crop was weaned in July 1954. Rectal temperatures and body measurements were taken. The calves had been made gentle enough so that the temperatures could be taken while they were tied to a fence. Morning and afternoon temperatures were taken with the animals standing in the shade. This was repeated in August.

Date	Time	Ambient Temperature	Average Herefords	Rectal Temperature Crossbreds
7-16-54	AM	85	103.4	102.7
	PM	104	105.8	104.4
8-11-54	AM	94	103.8	102.6
	PM	104	104.2	102.7

At weaning the crossbreds were heavier and in better condition than the Herefords. For heifer calves: Herefords averaged 430 lbs. and crossbreds 510 lbs.

The Hereford and crossbred steers were put in the feed lot in October which was at the end of the period of climatic stress. The heifers were sold at that time.

The performance of the steers is presented in the following table. In addition to the data listed there, cutout values were also obtained.

COMPARISON OF THE PERFORMANCE OF 3/4 HEREFORD 1/4 BRAHMAN STEERS WITH HEREFORD STEERS

	I 3/4 Hereford	II 1/4 Brahman Hereford	I - II
No. of Steers	6.	6.	
Weaning Weight	602.	469.	133 ± 35
Daily gain on summer pasture	1.04	.60	.44 ± .16
Daily gain in feedlot (10/6/54-3/31/55)	2.36	2.21	.15 ± .14
Final feedlot weight	1,120.	909.	211 ± 38
Feed per 100 lb. gain			
Barley	279.1	267.6	
MDBP	138.9	133.8	
Oat hay	80.8	81.2	
Alfalfa hay	458.6	365.3	
Total	957.4	847.9	109.5
Dressing percent*	59.6	56.3	3.3 ± .88
Carcass grades	1 Prime 5 Choice	5 Choice 1 Commercial	

*Based on shrunk weight just prior to shipment to Los Angeles and on 48-hour chilled carcass weight.

Four of the crossbred steers were from second calf four-year-old cows, whereas the rest were from first calf three-year-old heifers. According to studies of the effect of age of dam on weaning weight, such a difference in the age of dams might account for about a 20-pound bias in favor of the calves of the older cows.

San Joaquin Experimental Range

A genetic analysis has been made of weaning weight in two experimental range herds, A and B, of similar breeding that were managed alike except that in Herd A the cows were supplemented during the fall and winter when the range was nutritively deficient, while the cows in Herd B were not supplemented.

The data were standardized for differential effects of pasture, year, sex, age of calf at weaning, and age of dam.

Heritability of weaning weight was estimated to be .30. The experimental evidence did not support a hypothesis that the nutritive level at which a herd is operated influences the heritability of weaning weight.

Evidence is presented that in a herd operated under optimum nutritive conditions replacement heifers can be selected earlier and more effectively than in a herd operated under sub-optimum nutritive conditions. The relevant statistics are repeatability of weaning weight, estimated to be .51 in Herd A and .34 in Herd B, and regression of offspring's weaning weight on dam's weaning weight, estimated to be .42 in Herd A and -.06 in Herd B. A manuscript of this study has been prepared for publication.

VII. Publications and Manuscripts:

Carroll, F. D., W. C. Rollins, and N. R. Ittner. 1954. Brahman-Hereford crossbreds and Herefords--gains, carcass yields and carcass differences. J. Anim. Sci. 14:218.

Ittner, N. R., H. R. Guilbert, and F. D. Carroll. 1954. Adaptation of beef and dairy cattle to the irrigated dessert. Calif. Agric. Expt. Sta. Bul. 745.

Ittner, N. R., T. E. Bond, and C. F. Kelly. 1954. Increasing summer gains of livestock with cool water, concentrate roughage, wire corals, and adequate shades. J. Anim. Sci. 13:867-877.

VIII. Inventory of Animal and Facilities:

Location	Breed	One year and older			Females	Calves		Steers
		Females	Bulls	Steers		Bulls		
Davis	Hereford	57	32	18	9	10		
	Angus		2					
	Crossbred			2	2			1
San Joaquin Exp. Range	Grade Hereford	164		24	97	Steers and heifers		
	Hereford x Angus							
	Crossbreds	6			6	"	"	"
Imperial Valley	Polled Herefords		1					
	Grade Herefords	19			7			9
	Brafords	20						
	3/4 Hereford + 1/4 Brahma				9			9

In addition to the facilities previously listed, there is a new barn with the requisite working corrals and equipment including a scale. There are four lots for group feeding and 24 stalls for individual feeding. The individual feeding stalls and the corresponding loafing areas are grouped in four lots and hence afford additional facilities for group feeding.

Colorado Agricultural and Mechanical College

I. Station: Colorado Agricultural Experiment Station, Fort Collins, Colorado.

II. Project Title: R & M 26, Improvement of Beef Cattle Through Breeding. A Study of Inbreeding and the Crossing of Inbred Lines Within the Hereford Breed.

III. Personnel: H. H. Stonaker, Kent Riddle, M. H. Hazaleus, T. R. Blackburn, F. C. Daugherty, H. E. Lindholm, M. B. Hughes, R. S. Temple, G. O'Brien.

IV. Nature and Extent of Work Done This Year:

A. Observations on reproduction, growth, feed utilization and grades of inbred and line cross Hereford cattle at Fort Lewis. One of the important objectives of the work of the Colorado Station is to determine the effects of inbreeding and rotational crossing of inbred lines as possible means of increasing overall productivity of beef cattle. As has been reported this year (see references) considerable differences have been found between lines and crosses for cow performance characteristics and in the individual feeding performance of bulls. Further refinement on this study has been initiated in 1954-55 by the introduction of a "control" group consisting of 18 bred yearling heifers from four different purebred herds and a grade B bull, purchased at auction. These cattle will be carried as a group of "control" to be compared with a three- or four-line rotation using those lines which appear to have the best crossing potentialities. In addition to the marked differences in performance between the inbreds and crosses as reported last year, further evidence in a cooperating herd this year indicates that the line crossed steers fed by this feeder have out-performed "control" steers purchased from California, Texas, and Colorado ranches. At Fort Collins the past year 32 steers from 2 ranches are being individually fed. At the end of the first 196 days' feeding they rank as follows for daily gain: Royal Cross, Controls 1, Brae-Arden Cross, Controls 2, Colorado Cross and Prospector Cross. For pounds in efficiency they rank as follows: Brae-Arden Cross, Royal Cross, Controls 1, Colorado Cross, Controls 2, and Prospector Cross. In degree of fatness at 196 days: Controls 2, Royal Cross and Colorado Cross (tie), Brae-Arden Cross and Controls 1 (tie) and Prospector Cross last. It is of interest that the breeder of the Controls 2 has conducted feeding tests on his own bulls. Another test has been started at Fort Lewis in which the 35 youngest 1954 inbred and line cross heifers are being individually fed a fattening ration and will be slaughtered in the summer of 1955. It is planned to continue this slaughter of the youngest half of the heifer calf crop so that further evidence concerning carcass as well as feedlot characteristics of these lines may better be determined.

B. Association between inbreeding and blood antigen occurrence in inbred lines of Hereford cattle.

The blood grouping of the cattle in the inbred lines at Fort Lewis has been useful and of interest in several ways. First, it gives a useful, although not perfect, check on parentage of the calves within a given line. Second, cattle offer a unique opportunity for studying the genetic behavior of a large number of loci which insofar as we are aware are not

subject to planned selection. This study has thus indicated that there are definite genetic differences between lines insofar as their blood groups are concerned. The frequencies of the occurrence of different antigens in the different lines are significantly different from one another in many cases. The second interesting aspect of the blood typing program which has been carried on in conjunction with the Ohio State University Experiment Station since 1950 has indicated that with the increased inbreeding fewer antigens are being found than were found in the foundation stocks. However, the antigen loss has been significantly greater than would have been expected from the average rate of inbreeding which has taken place. This rate of loss is greater in some lines than in others. Among possible explanations are that this increased loss is due to chance, may lie in some genetic phenomenon which causes the inbreeding to rise at a faster rate than computed by inbreeding coefficients, or may be due to the fact that the heterozygous class has been maintained in the population at a higher frequency than would be expected under random mating. As yet, it is not possible to critically assess the biological nature of this significant deviation from expected.

C. Correlation and heritability studies on steers fed to a constant slaughter grade.

Analysis has been continued on the data accumulated on individually fed steers and the carcasses from these steers. The heritabilities on 42 traits vary from negative values to very high positive values. With 118 steers and 20 sires represented, the standard errors of these heritabilities are high. The heritabilities on rate of gain, efficiency of feed utilization and skeletal measurements are generally high as previously has been reported. Heritabilities of scores on body conformation and marbling, the latter adjusted for difference in age and fat percent, are approximately zero. These heritabilities have not been published, but are available in mimeograph and thesis form. A large number of phenotypic correlations between these traits have been computed and some of these are being used in developing a selection index for beef cattle.

D. Testing for phenotypic distinctions of ++ and +d genotypes in dwarfism studies.

All newborn calves at Fort Lewis during the 1955 calving season have been x-rayed and analysis of these x-rays is being made with the cooperation of Dr. Hazel of Iowa State College. The diagnoses made from these x-rays will be correlated with the genetic history of the lines and crosses. Profilometer readings have been taken again on the 1954 unselected bull calf crop. In addition, repeated profilometer readings have been taken on those bulls which were retained for herd sires and as has been the experience in the past, yearling bulls which have a +d prediction continue to have a +d prediction a year later.

E. A "control" group of Hereford heifers was purchased in the fall of 1954.

These bred yearling heifers came from four different purebred breeders. They represent the get of 11 different purebred sires and were bred to a number of different bulls before they were purchased. This "control" group will be bred to a different bull each year purchased in a purebred

auction and, insofar as possible, unrelated to the lines being used at Fort Lewis. A rotational cross using not fewer than three or four of these lines thought best for crossing purposes will be compared with these "control" cattle for a study of overall performance of the cow herd. Subsequently, the feeding performance of the sons and daughters of the controls will be compared with the rotational cross.

F. Semen Tests of Yearling Bulls

This year, for the first time, through the cooperation of Drs. H. J. Hill, Frank Scott, and F. X. Gassner, semen samples were taken of the unselected bull calf crop at Fort Lewis in February when the bull calves averaged approximately 10 months of age and again the latter part of May when these same bulls averaged approximately 13 months of age. At ten months of age the semen quality of the bulls was for the most part immature with 24 percent of the bulls showing mature semen. These bulls at 13 months of age, however, were for the most part (85 percent) sexually mature as judged from their semen samples. It was possible to collect the semen at these young ages by the use of an electroejaculator developed by W. Marden of the Endocrinology Section. An interesting genetic abnormality has apparently appeared within at least one inbred line in which four out of six bulls showed complete immaturity at 13 months of age. The bull which would have been selected on performance showed no live sperm. In the same line in 1954, the selected bull sired no calves and subsequent semen tests showed dead sperm. In no case was a line cross bull found which showed infertility.

V. Summary of Progress and Conclusions to Date:

On an average, the evidence appears fairly certain that with inbreeding as being practiced a marked loss in fertility and weaning weight has been found in the Hereford cattle in this experiment. In the development of the numerous inbred lines, there is variation in the apparent loss of vigor and performance. Some lines appear to maintain their performance and perhaps even improve (although as yet it seems difficult to develop any very definite evaluation of whether progress, regress, or no change is actually being obtained in a breeding experiment such as this with beef cattle. It also appears fairly certain that there is considerable variation in the way in which the lines cross. Some crosses appear to be quite promising in their overall ability to increase productivity; other lines seem to be lacking in these qualities. It would thus seem that it may be plausible to cull some of the inbred lines within the near future on the basis of their crossing performance. The greater frequency of striking abnormalities in the inbred lines as compared with the crosses and the varied types of abnormalities produced indicates that it would be unusual to find lines which carry no deleterious genes. While the numbers within the different lines are limited to make definite genetic analyses of the ones which have occurred, they are suggestive that there is a genetic pattern for immature ovaries, development of immature sperm, spastic, eye abnormalities such as cross eyes, bowed knees and two types of dwarfism. In addition to these more striking abnormalities, line differences are apparent in their blood characteristics, in disposition, in weaning performance and feedlot performance. The development of inbred lines has provided a vivid demonstration of wide and varied types of genetic differences between different families of cattle, and this suggests wide genetic differences which one

might expect between individual animals in an outbred population. Thus far, the results encouragingly indicate that from the inbred lines being formed there will be a few which will have promise of commercial utilization. The lines under observation have offered very useful material for checking other approaches being used in overall beef cattle improvement such as means of selecting against deleterious genes such as dwarfism. The Fort Lewis herd has indicated that thus far considerable caution and further investigation is needed before depending too greatly upon such devices as the profilometer for detecting the dwarf carrier. It is hoped that the herd will continue to serve this purpose in providing valuable genetic material for testing the x-ray technique as well.

VI. Work Planned for the Future:

We hope to be able to continue what we have in the past and in addition with the cooperation of the departments of Economics and Home Economics to gain information on the carcass cut-out values and cooking tests of cattle with different genetic backgrounds. Particularly it is hoped that a more objective technique may be found for determining the degree of fatness and muscling in vivo. It would appear that performance testing could be much more realistic if some more direct measure of the actual meat and fat being produced could be determined on prospective breeding animals. It is hoped that the use of a sonar device, the somascope, may prove useful in this attempt. Tests will also be made this summer with the lean meter developed by Andrews of Purdue, but we will probably discontinue those techniques for measuring the electrical resistance of the animal body as reported in last year's reports.

An increasing number of bulls have been placed out on the cooperative basis with FFA members and from these bulls we hope to obtain more comparisons at least to the weaning ages of their calves' performance relative to calves by other outbred sires.

The pattern of the lumbar vertebrae as detected through x-ray pictures will probably be correlated with numerous birth measurements and subsequent performance of the cattle as they go through the feeding tests.

It is hoped that further progress can be made in the analysis of the already unwieldy amounts of performance and carcass data which have been accumulating.

VII. Publications and Manuscripts:

Behrens, W. C. 1955. Genetic and phenotypic relationship between estimates of fat deposition in Hereford steers. M.S. Thesis.

Kushwaha, N. S. 1955. Association between inbreeding and blood antigen occurrence in inbred lines of Hereford cattle. M. S. Thesis.

Stonaker, H. H. 1954. Observations on abnormalities, reproduction, growth, feed utilization, and grades of inbred and line cross Hereford cattle. J. Anim. Sci. 13:963.

1955. Breeding for hybrid vigor. Colo. Agr. Exp. Sta, Gen. Series Paper 613.

Kushwaha, N. W., L. C. Ferguson, and H. H. Stonaker. 1954. Association between inbreeding and antigen occurrence in inbred lines of Hereford cattle. (Abs.) J. Anim. Sci. 13:960.

Colorado Agricultural and Mechanical College. 1955. Feeders Day: Featuring livestock feeding in Colorado. Gen. Series Paper 605. March 23.

Summary of data on profiling as requested in the 1954 resolution of W-1 Committee
Colorado Agricultural Experiment Station, July 1955

Analysis of offspring of sires profiled clean *, carrier #d, or intermediate *, and of dams whose sires fall into similar classification or are of unknown classification

	Number of Progeny												
	Normal calves			Dwarf calves			Premature or stillborn			Died before 2 months			
	Sire classification by profile			Sire classification by profile			Sire classification by profile			Sire classification by profile			
	#d	**	Int	Ld	u*	Int	ud	as	Int	#d	as	Int	
Proven carrier cows	1			3									
Daughters of proven carrier bulls	1												
Daughters of bulls profiled #d	25	3					2				1		
Daughters of bulls profiled **	1	1											
Daughters of bulls profiled Int	37	1	11				2		1				
Daughters of bulls, classification unknown	237	34	25				17	1		6	1	1	

* Bulls having a profile whose discriminant function lies between 5.5 and 8.5 are classified as Intermediate.

I. Cattle Inventory
A. Purebreds

BEEF BREEDING PROJECT SUMMARY
Fiscal Year 1954-55

State Colorado
Date June 1955

Line designation	Bonanza	Brae Arden	Colo.	Don	La Plata	Monarch	Prospector	Royal	San Juan
Breed									
Station	Ft. Lewis								
Bulls (12 mo. or over)	1	1	2	1	1	1	1	1	1
Cows (2 yrs. or over)	6 (11)	8 (8)	7 (8)	7 (9)	10	7 (3)	7 (11)	8 (8)	8 (13)
Heifers, yearlings	3 (3)	3 (3)	1 (2)	1 (8)	0	0 (2)	1	3 (1)	2 (1)
Bull calves	3 (2)	5 (3)	0	3 (2)	4	5 (5)	5 (6)	*	*
Heifer calves									
Percentage use for breeding project	2 (3)	3 (5)	0	4 (4)	5 (3) 100%	4 (2)	1 (1)	*	*
Estimated cash value									

B. Grades

Line designation	Verde	Plus	Real Prince	Elector	Model	English	Ft. Lewis	Mesa	Con-trols	Crosses	Ft. Lewis	Leased
Breed												
Station	Ft. Lewis			Leased Herds								
Bulls (12 mo. or over)	1	1	1	1	1	0	1	1	1	0	Bulls 11	7
Cows (2 yrs. or over)	Outcross in 1955	7	9	8	6	6	9	8	18		Cows 157	53
Male calves	3 (2)	No complete report at this date					(1)	(5)	6		Calves (M) 60	
Heifer calves											Calves (F) 67	
Percentage use for breeding project	3 (6)					(7)	(7)	(4)	7			
Estimated cash value						100%					\$53,750.	

Linecrosses

* No matings in 1954 crossed.

II. Young animals which were in feed during 1954-55.
A. Purebreds

	Herefords			Angus		Shorthorns	
	Number individually fed	Number group fed		Number individually fed	Number group fed	Number individually fed	Number group fed
Bulls	83						
Heifers	37						
Steers							
B. Grades							
Bulls							
Heifers							
Steers	32						

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Additions of land, physical facilities and equipment during fiscal year 1954-55 *			
Item	No.	Actual Cash Value	Percentage use for Beef Breeding Project
Cows and heifers	180	\$ 36,000	100%
Bulls	6	2,400	100%
6,000 acres range land (6 year lease)		120,000	100%
1/2 interest in x-ray equipment		600	

* To simplify administration the Fort Lewis herd and use of the range land has been transferred to the Colorado Agricultural Experiment Station until 1961.

University of Hawaii

- I. Station: Hawaii Agricultural Experiment Station, Honolulu, Hawaii.
- II. Project Title: The Improvement of Beef Cattle Through the Application of Breeding Methods.
- III. Personnel: Oliver Wayman, L. A. Henke, H. J. Weeth, and J. H. Koshi.
- IV. Nature and Extent of Work Done This Year:
 1. The collection of weight and grade data at 240, 365 and 605 days has continued. This year provides the first 20 months' data on calves in the project.
 2. One of the cooperating ranches in the project has withdrawn due to a change in management. Routine data on the animals already under study in this herd will be continued through 20 months (605 days).
 3. Three cooperators have offered to expand the extent of our project with them. This has been approved. The increase will amount to 45 registered Herefords on one ranch and 270 grade Hereford cows in six herds on the other two ranches. Cross fencing and scale facilities have been added to accommodate these herds.
 4. Began a photo record of animals by grade as a reference for stabilizing grading as well as educating ranchers. Equipment for this work was purchased.
 5. Plans have been drawn and construction is under way for a portable livestock scale which can be towed over the extremely rough and steep roads in some areas. The scale will have a squeeze chute mounted on the platform to permit handling of range animals. Appreciation is expressed to the Wyoming Station for its contribution in this field. Our scale is being made with a lever system the full length of the platform. The design also permits centering the chute to give better balance for use on ranch roads.
 6. Equipment has been acquired to make profilometer studies of horned Hereford bulls of the Territory.
- V. Summary of Progress and Conclusions to Date: Important differences in weight for age in the three age groups studied are shown between sire progeny groups under conditions of serious malnutrition. These differences vary between ranches due to severity of malnutrition and differences in husbandry. Differences in average weights observed are shown in table 1.

Table 1. Difference in adjusted average weight of calves from best and poorest performing bulls at 240, 365 and 605 days of age by cooperators.

Cooperator	Males					Females				
	A	B	C	D	E	A	B	C	D	E
Age in Days 240	14	8	112	96	8	68	4	53	61	5
365	124	7	99	77	28	45	3	37	63	7
605	85	4	-	76	76	19	32	65	95	19

The economic significance of these differences can best be appreciated in relation to the under-developed condition and small size of even the best sire groups during this period. There is some change in "best" and "poorest" sire at each age group. However, the evaluation tended to be consistent with sires within groups.

Correlations between weights for age at the different ages have not been completed.

One important contribution of the project thus far has been outside the field of breeding per se. This has been a record documentation of the poor response of unsupplemented calves from weaning time until one year of age on the ranges of Hawaii. In many herds this stunting is still evident at 20 months of age. Work is being done to correct this situation.

VI. Work Planned for the Future:

Continue weight and grade for age program as now established.

Extend profiling service to ranchers as time is available and personnel can be trained to do the profiles satisfactorily.

Analyze data available with a comparison of response by sire groups under "good" and adverse conditions for growth.

VII. Publications and Manuscripts:

None.

VIII. Inventory of Animals and Facilities:

a. Animal Inventory:

Line designation	Registered										Grades			
	3+	3-	4+	4-	5-	6-	0-	1+	CO	CM	D16	E1&2	New E lines	
Breed	Heref.	Heref.	Heref.	Heref.	Heref.	Heref.	Heref.	Heref.	Heref.	Heref.	Heref.	Heref.	Heref.	
Ranch	Parker	Parker	Parker	Parker	Parker	Parker	Parker	Parker	Kukaiau	Kukaiau	Kaaluau		Kapapala	
Bull (12 mo, or over)	8	5	1	10	2	1	4	2	5	7	10		8	
Cows (2 yrs. or over)	125	125	125	125	125	125	125	125	32	37	200		200	
Heifers, yearlings	4	8		10	2		1		20	22	22			
Bull calves	3	7	1	15	1	5			12	13	27			
Heifer calves	1	9	1	12	0	6			16	20	21			
Percentage use for project	100	100	100	100	100	100	100	100	100	100	100		100	
Estimated cash value (dollars)	7,975	16,500	3,075	37,800	6,725	10,925	3,250	1,150	18,100	21,275	71,600		55,000	

b. Additions of land, physical facilities, and equipment during fiscal year:

Item	Actual Cash Value
Photographic Equipment	\$ 738.82
Profilometer	226.20
Squeeze Chute Portable Scale	\$1,500.00 *
Total	\$2,465.02

* Encumbered on bid.

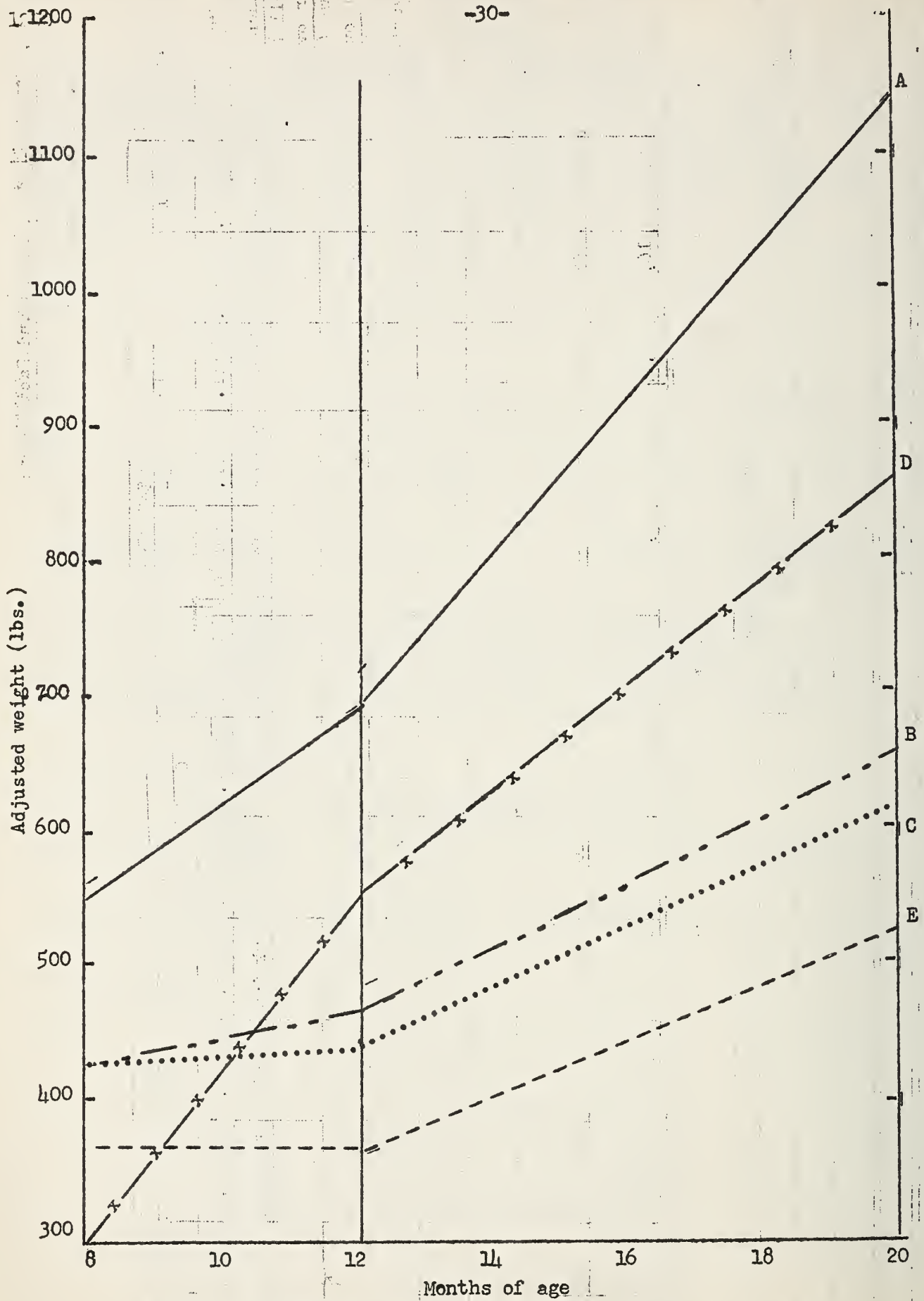


Figure 1. Comparative rate of gain of bull calves at 240, 365 and 605 days of age by ranches.

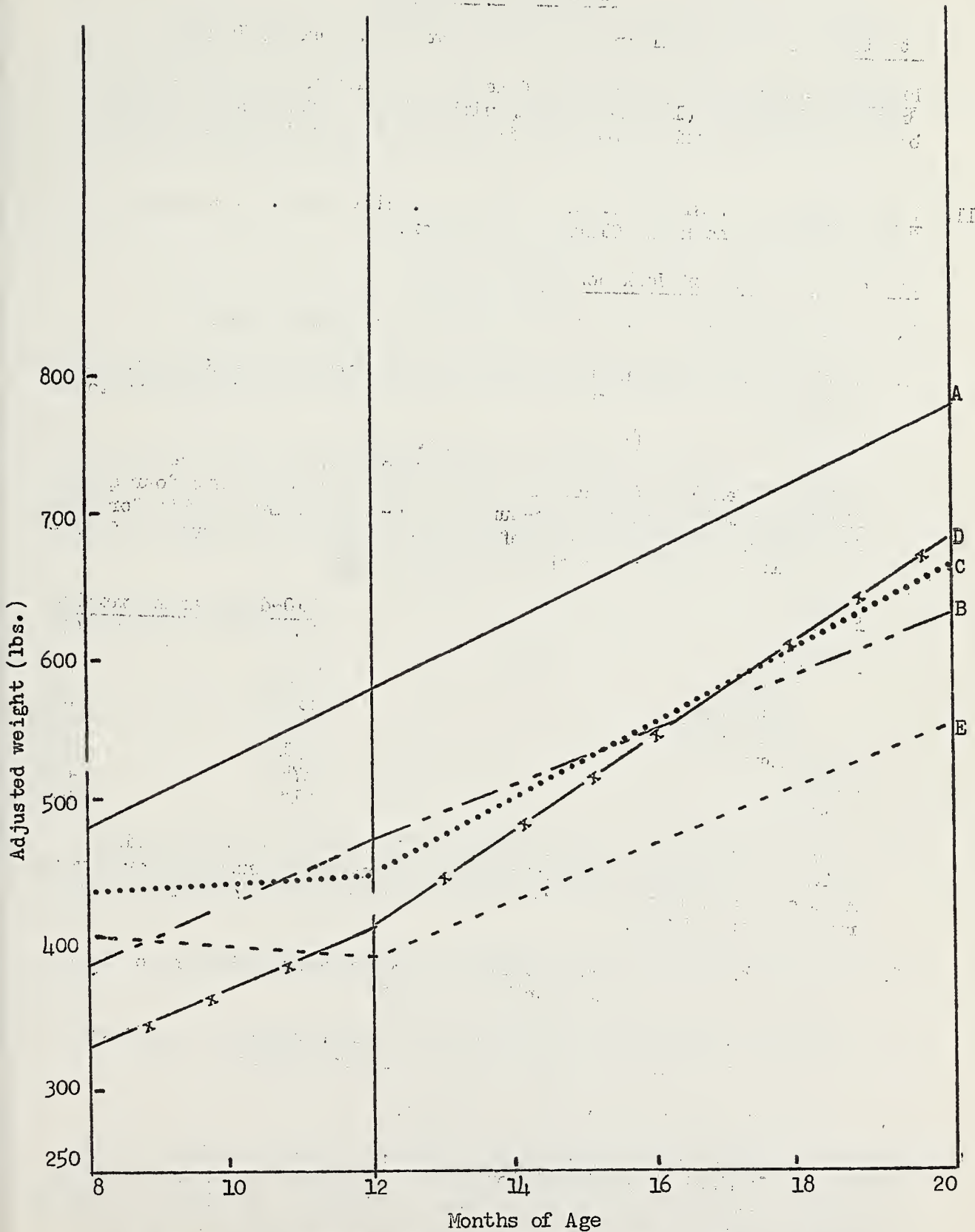


Figure 2. Comparative rate of gain of female calves at 240, 365 and 605 days of age by ranches.

University of Idaho

- I. Station: Idaho Agricultural Experiment Station, Moscow, Idaho.
- II. Project Title: The Improvement of Beef Cattle Through the Application of Breeding Methods: (1) Linebreeding within the Hereford and Shorthorn breeds. (2) By testing linebred sires within the various lines which will be developed.
- III. Personnel: C. F. Sierk, T. B. Keith, C. W. Hickman, W. P. Lehrer, Jr., and C. W. Hodgson, and R. T. Clark, Coordinator.
- IV. Nature and Extent of Work Done This Year:

1. Continued gathering routine ROP data on cows and calves.
2. Completed calculation of coefficients of inbreeding on Shorthorn herd. Coefficients ranged from 0 to 32 percent based on a five-generation pedigree.
3. Analysis of weaning weights in the Hereford herd shows a definite effect of family. Females in the Hereford herd fall into four quite distinct family groups. Two-hundred-ten-day weaning weights for the four family groups in the Hereford breed and for the Angus and Shorthorn calves are shown in the following table:

<u>Breed</u>	<u>210-day weaning weight</u>	
	BC	CC
Hereford		
Group I	424	435
Group II	432	419
Group III	532	455
Group IV	491	461
Angus	475	439
Shorthorn	418	384

4. Since the 1954 calf crop is the first full calf crop on a spring calving basis only, the performance data are being analyzed for development of a selection index for culling the cow herd and selection of replacement heifers.
 5. The 1955 breeding season provides for continued development of lines within the Hereford and Shorthorn breeds.
 6. Continued cooperation with two breeders and assisted two additional breeders in developing a performance testing program.
 7. Continued supporting nutrition studies.
- V. Summary of Progress and Conclusions to Date: Progress to date has consisted principally of gathering ROP data on the cows and their offspring, setting up the lines of breeding within the Hereford and Shorthorn breeds, developing facilities for gathering performance records and cooperating with several breeders interested in a performance program. The only conclusion to date is the same as that resulting from other programs of

this type, namely, there is ample variation in all performance factors which should result in improvement, if selection is directed toward a minimum number of these factors and that there appears to be a negative relationship between weight for age and acceptable type which perhaps should be defined as a show type.

VI. Work Planned for the Future: Continued gathering ROP data, analyzing these data as they become available and emphasizing carcass studies.

VII. Publications and Manuscripts:

Keith, T. B., R. F. Johnson, and W. P. Lehrer. 1954. Optimum ratio of concentrate to alfalfa hay for steers as affected by protein level and method of feeding. Idaho Agr. Expt. Sta. Res. Bul. 26.

Idaho Agricultural Experiment Station. Four years of cooperative bull feeding work at the Caldwell Branch Station. In preparation.

BEEF BREEDING PROJECT SUMMARY
Fiscal Year 1954-55

I. Cattle Inventory
A. Purebreds

State Idaho
Date June 1955

Line Designation			
Breed	Hereford	Shorthorn	Angus
Station	Moscow	Moscow	Moscow
Bulls (12 mo. or over)	21	5	1
Cows (2 yrs. or over)	52	31	18
Heifers, yearlings	16	10	4
Male calves	22	12	8
Heifer calves	23	11	6
Percentage use for breeding project	90	90	90
Estimated cash value			

II. Young animals which were on feed during 1954-55:
A. Purebreds

	Hereford	Angus	Shorthorn
	Number Individually Fed	Number Individually Fed	Number Individually Fed
Bulls	20 at Moscow	0	4
Steers (group fed)	9	5	3

III. Additions of land, physical facilities and equipment during 1954-55:

Item		Actual cash value	Percentage use for beef breeding project
Addition to abattoir		\$ 9,200	50

IV. Funds expended during fiscal year 1954-55:

Source		Amount Non-recurring Items	Amount Operating Expense
9 B3		\$ 300	\$ 5,700
State-controlled funds		9,200	14,800

I. Station: Montana Agricultural Experiment Station, Bozeman, Montana, and
North Montana Branch Station, Havre, Montana.

II. Project Title: The Improvement of Beef Cattle Through the Application of Breeding Methods. W-1, M. S. 873, A. I. 104, North Montana Branch Station 71.

1. The establishment of inbred lines of registered Hereford cattle, both horned and polled, that will result in improvement in such characters as rate and economy of gain, fertility, nursing ability, longevity, and carcass quality.

Maintain an outbred herd of Herefords with bulls selected and furnished by the purebred breeders. The bulls are to be primarily good, high-scoring individuals according to breed association standards.

2. Establishment of an improved herd of registered Angus cattle in which the males are selected on a high level of performance as indicated by standard record of performance procedures.

3. Investigate feasibility of breeding for specific combining ability through recurrent selection.

III. Personnel: F. S. Willson, A. E. Flower, Joseph J. Urick, E. P. Orcutt, John J. Sturm, R. T. Clark, USDA, Denver, J. R. Quesenberry, USDA, Miles City.

IV. Nature and Extent of Work Done This Year:

Table 1. Summary of Data on Havre Hereford Herds in Recurrent Selection Trials.

[illegible]

Table II
Third Year Crossline R.O.P. Steers
Summary Winter Feeding and Marketing
North Montana Branch Station - Havre, Montana

Date: October 27, 1954 to May 11, 1955 (196)

	Line Bred Sire Group MC 387	CROSSLINE SIRE GROUPS					
		HL ₁ 762	HL ₁ 768	HL ₂ 713	HL ₂ 752	HL ₃ 615	HL ₃ 754
No. of Head	7	7	4	4	5	5	5
No. of Days Fed	196	196	196	196	196	196	196
Mean Score	78	75	76	75	73	76	76
Initial Weight	463	477	505	467	438	458	488
Final Weight	891	914	922	866	818	862	923
Total Gain	428	437	417	399	380	404	435
Average Daily Gain	2.18	2.23	2.13	2.04	1.94	2.06	2.22
Marketing Data:							
Sales Weight	812	834	843	794	747	782	838
Cold Carcass Weight	491	505	519	487	462	478	512
Dressing Percent	60.5	60.6	61.6	61.4	61.9	61.3	61.0
Slaughter Grade	13	12	11	11	12	13	12
Carcass Grade	15	15	16	16	10	14	14
Price/Cwt. on Rail	33.57	33.57	33.00	33.00	35.00	33.80	33.80
Length of Body mm.	1136.	1153	1155	1117	1075	1131	1151
Length of Hind Leg	721	724	725	710	699	715	726
Circum. of Round	833	843	870	853	850	835	846
Depth of Body	375	366	379	355	366	368	365
Length of Loin	586	603	608	570	585	577	595
Width of Shoulder	397	411	406	413	398	411	422
Width of Round	459	473	462	461	439	463	474
Area of Rib-eye Sq. In.	9.41	9.53	9.95	10.14	9.45	8.64	10.47
Rib-eye Index	258	245	270	255	247	265	237
Fat Thickness mm.	12.1	13.3	14.7	15.5	15.9	12.7	14.4

It is noted here that the crossline steers, when compared with the grade Miles City line 1 steers excelled the M. C. I. group in initial weight in four out of six sire groups, in final weight in three out of six sire groups. In slaughter grade, they excelled in all but one group which was equal. In price per cwt., sold on the rail, three crossline groups sold for less than the line steers while three sold equally high or higher. In every case but one, the crossline steers exceeded the rib-eye area of the Miles City line 1 steers.

It would appear that whatever hybrid vigor is being obtained in the crosses is being essentially offset by the desirable characteristics inherent in our Miles City line 1 grades at this stage, if we may judge by the small sample represented in this year's crop of carcasses. However, previous years' data seem to indicate some advantage for the crosslines. Furthermore, at this stage in the project, sire effect is probably large as compared with line effects in the production of crossline steers.

Crossline and replacement heifer data seem to fall into a similar pattern to that indicated for the crossline and line steers. Havre line 1 heifer data is omitted from this report since this group of calves received special attention due to late calving last year in that line.

This year, with two sires per line yielding complete crossline progeny test for growth, conformation, and carcass characteristics; and with bulls available from two previous years of progeny test for crossline performance, it was possible to exercise considerable choice between bulls to head the line for the 1956 calves in the three Havre herds.

Besides the 37 head of grade steers that were fed at the Havre station this past year, there were 53 grade heifers group-fed. Most of these heifers were crossline heifers; however, the total does include some 14 head of grade replacement heifers that will go into the Miles City tester line. There were also 31 purebred heifers that were group-fed. Of this group, replacement heifers will be selected to go into the three purebred Havre lines. At the Bozeman Station, we group-fed some 9 purebred Hereford heifers and 3 steers as well as 8 Angus heifers and 5 Angus steers. Selection will be made out of these for replacements. The bull calves that were castrated were mostly late calves and will be used primarily for judging classes this next year.

There were 24 Hereford bulls that were individually fed in the indexing program at the Havre Station. At the Bozeman Station, we indexed 7 Hereford bulls and 6 Angus bulls. The usual variation in gains of close to a pound a day was in evidence this year; however, it was also noted that the bulls at the Bozeman Station did not gain quite as well as in previous years. This is largely due to the fact that the feeder fed them at a lower plane of nutrition than in previous years. Their daily feed consumption averaged 8.6 pounds of concentrate and 5.5 pounds of hay. The concentrate-hay ratio was 1.5 to 1.

The Montana Aberdeen-Angus Breeders Association formed a committee to select a good show type bull to be used on part of our Angus herd this year. This is similar to the action taken previously by the Montana Hereford Association. The progeny from these show type herds will be compared with our herds that are selected on regular record of performance

criteria. The Montana Agricultural Extension Service, through their livestock specialists and county agents, are continuing to assist breeders in the indexing of bulls on their own ranches. In this connection, a program of certification of bulls has been initiated (copy of certificate attached). They also have many cooperators who have adopted rather extensive improvement programs based primarily upon record of performance procedures.

V. Summary of Progress and Conclusions to Date: There continues to be an increasing interest on the part of feeders in trying to locate steers from herds that have been using high indexed bulls. We are making more of a concerted effort this year to get in touch with the commercial feeders in the corn belt area. In cooperation with the U. S. Range Livestock Experiment Station and our Extension livestock specialists, we have arranged for a feeders' field day at the U. S. Range Livestock Experiment Station, at Miles City, on June 27. We have also asked all the extension specialists, research men, and feeders from the corn belt area to try to attend this field day and find out more about the certainty of improved performance in the feed lot due to the using of high indexed bulls.

VI. Work Planned for the Future: Our plans will probably not change very much during the next year; however, we have been discussing considerably the matter of adequate controls in our breeding program. It seems to be one of the biggest stumbling blocks in the project. I have contacted a rancher that has been very much interested in this program with the idea of getting him to use some of our line bred indexed bulls and our outbred, breeder-sponsored bulls in a breeding program on his commercial cows. He seems very much interested in such a test and I feel quite confident that we will be able to line up a cooperative program with this man in the future. Thus, evaluation of our breeding programs may be made in a controlled commercial top crossing test.

CERTIFICATE OF BULL INDEXING

THIS IS TO CERTIFY:

That _____ of _____, Montana,

conducted a FEED UTILIZATION TEST on his bull calves during the year just past; that I assisted him and weighed the below described bull onto index and off index and that this bull's description and rate of gain were as follows:

_____ L.E.; _____ R.E.; _____ Breed;
 (Tattoo) _____ (Tattoo) _____
 _____ % (or _____ lbs.) was the average rate of gain per head
 per day for _____ head of bulls on this test, and
 _____ % (or _____ lbs.) was the rate of gain per day for this
 bull.

Signed: _____
 County Extension Agent
 Montana Extension Service

Date: _____, 19____

VII. Publications and Manuscripts:

Montana Agricultural Experiment Station. 1954. Livestock and range research in Montana. Mont. Agr. Expt. Sta. C. 206.

Willson, F. S., J. J. Urick, and A. E. Flower. 1954. Genetic studies of steer progeny groups slaughtered following three successive feeding treatments. (Abs.) J. Anim. Sci. 13:965.

_____. 1955. Livestock research at Montana State College. Montana Stockgrower. April 15.

Woodward, R. R., J. R. Quesenberry, and F. S. Willson. 1954. Production and carcass quality. Mont. Agr. Expt. Sta. C. 207.

I. Cattle Inventory
A. Purebreds

BEEF BREEDING PROJECT SUMMARY
Fiscal Year 1954-55

State: Montana
Date: June 1955

Line designation	Havre			Bozeman		
	H.L. 1 Polled Hereford	H.L. 2 Horned Hereford	H.L. 3 Horned Hereford	A Inbred Hereford	B Outbred Hereford	C Angus
Station	N.M.B.S.	N.M.B.S.	N.M.B.S.	Bozeman	Bozeman	Bozeman
Bulls (12 mo. or over) @ \$400	8	6	5	8	0	7
Cows (2 yrs. or over) @ \$250	19	32	8	24	12	24
Heifers, yearlings @ \$150	5	8	4	5	4	8
Bull calves @ \$100	4	11	10	9	5	5
Heifer calves @ \$100	11	11	10	10	4	7
Percentage use for breeding project	100	100	100	60	60	60
Estimated cash value	10,200	13,800	11,600	11,850	4,500	11,200

B. Grades

Line designation	M.C. Tester					
Breed	Hereford					
Station	N.M.B.S.					
Bulls (12 mo. or over) @ \$300	1					
Cows (2 yrs. or over) @ \$200	131					
Heifers, yearlings @ \$150	47					
Male calves @ \$75	64					
Heifer calves @ \$75	59					
Percentage use for breeding project	100					
Estimated cash value	42,775					

II. Young animals which were on feed during 1954-55.
A. Purebreds (Bozeman Station.)

	Hereford		Angus		Shorthorn	
	Number Individually Fed	Number Group Fed	Number Individually Fed	Number Group Fed	Number Individually Fed	Number Group Fed
Bulls	7		6		None	
Heifers		9		8		
Steers		3		5		
B. Grades						
Bulls			None		None	
Heifers						
Steers						

A. Purebreds (North Montana Branch Station.)

Bulls	24		No Angus			
Heifers		17				
Steers						
B. Grades						
Bulls						
Heifers		45				
Steers		37				

III. Additions of land, physical facilities and equipment during fiscal year 1954-55.

Item	No.	Actual Cash Value	Percentage use for Beef Breeding Project
None at Bozeman	1		
At the North Montana Branch Station at Havre			
Addition of facilities in the form of a veterinary addition			
At headquarters		\$1,500.00	100%
Remodeling Shed for Calving at Headquarters		500.00	100%
Rebuilding Corrals			
At the lease		750.00	100%

University of Nevada

- I. Station: Nevada Agricultural Experiment Station, Reno, Nevada.
- II. Project Title: The effect of environment on selection for traits of economic importance; the relative value of several selection criteria; and reproductive studies in range beef cattle.
- III. Personnel: James F. Kidwell, leader; H. J. Weeth, V. R. Bohman, J. E. Hunter, C. R. Torell, assistants; J. H. Robertson, L. O. McCartney, W. B. Dye, J. A. McCormick, cooperators; permanent and temporary farm labor, student assistants; R. T. Clark, Coordinator.
- IV. Nature and Extent of Work Done This Year: The W-1 Technical Committee recommended, at the 1954 annual meeting, that the grade herd be replaced with purebreds, and the five lines be established from a common foundation. This recommendation has been effected, and materially improves the project. Forty-five purebred yearling heifers were added to the herd, and five lines established by allotment at random within sire and age groups.

The improvement of physical facilities was continued during the year. Materials have been purchased for cross fencing the experimental range. Modest, but functionally complete and adequate, physiology and nutrition laboratories were established. They contribute materially to the project. Corrals and individual feeding pens with a capacity of 50 steers were constructed.

A new position in animal breeding has been created. Approximately twenty-five percent of the assignment will be concerned with beef cattle breeding research.

Analysis of data relating to conformation and carcass quality in fat calves was completed. Since this material was published in the Journal of Animal Science, details need not be repeated.

The investigation, initiated last year, of the possible use of filter paper electrophoresis to identify individuals heterozygous for the dwarf conditioning gene has been continued. The study has been hampered by lack of necessary equipment and supplies. However, these difficulties have been surmounted, and this investigation may be more vigorously pursued.

Work has been initiated to determine whether the method of Stran and Jones to determine early pregnancy in the human can be adapted to the bovine. The method involves the migration of chorionic gonadotropin in the urine. Although this work has been hampered by lack of equipment, it has been shown that the method as used for humans cannot be used for the bovine. It may be possible, however, to adapt it to the bovine.

The calves dropped in 1954 at Reno were started on individual feeding on a ration consisting of 65 percent grass and clover hay and 35 percent grain in the form of 1/4 inch pellets. The calves started on feed well, but bloat soon became a problem. It became more severe as the test period progressed and did not respond to feeding 2 pounds of straw per day. Three animals were lost in two days, and a single animal was lost earlier despite the vigilance of the herdsman. The conditions appeared peculiar

in several respects. Animals would bloat within 30 minutes of being fed. If they were hosed, there would be no recurrence of bloat at that feeding. Those animals that died were observed during the first fifteen minutes of feeding and exhibited no evidence of bloat. They bloated and died within a thirty-minute interval. Since these problems are of great importance in feed testing, they are being investigated. Detailed observations indicate that rumen function may not be normal on the pelleted ration. If this is true, at least some question may exist as to the utility of a pelleted ration for testing.

Fifty-four yearling steers were individually fed, half for 84 days and half for 140 days. An attempt was made to obtain ten steers of each of the following grades: Choice, good, medium, common, and inferior. Actually, forty-seven steers distributed among these grades were obtained. It became apparent, when the steers were assembled, that Holstein steers did not fit into this classification. Consequently, seven Holstein steers of about the same weight, but six months younger were added. The steers were weighed, measured, graded, and blood glutathione, hemoglobin and total cell count determined at the start of the trial. They were individually fed a standard hay and concentrate fattening ration. At the conclusion, the same data were taken as at the start. In addition, dressing percent, shrink, carcass grade and weight, and weight of the round, loin, rib, chuck and plate were obtained. The percent bone, muscle and fat in the 9, 10 and 11 rib were determined and the percent water, protein, fat and ash in the muscle and fat of the 3 rib cut determined. The relation of blood level of glutathione to size and subsequent rate and economy of gain has been determined, and a manuscript prepared. The data will also be analyzed to study the following:

1. The relation between body measurements and feeder grade.
2. The relation between feeder grade and body measurements and subsequent rate and economy of gain.
3. The relation between body measurements and rate and economy of gain and carcass quality.
4. The relation of the wholesale cuts, weighted according to price, to carcass value and grade.

Further data have been gathered relating to early allometric growth and analysis has been partially completed. It is not yet possible, however, to draw any conclusions.

An analysis of some existing data and completion of an experiment has permitted a study of the influence of type and size on growth and development of cattle. A manuscript is in progress.

The routine work of the project was carried on during the year. Calves were individually fed, breeding herds assigned, measurements taken, etc.

V. Summary of Progress and Conclusions to Date:

The project has progressed along several lines simultaneously. Most important is the acquisition of a herd of approximately 125 mature females devoted entirely to breeding research. Hardly less important is the acquisition and development of farms, range area, feeding facilities, etc., and modern laboratories devoted to beef cattle breeding. This project has also served as the focal point for developing an entire department. Its ramifications and implications for this institution and for the livestock industry of this state are numerous and varied.

It seems reasonable to conclude that during the past year such things as physical facilities, personnel, experimental animals, and laboratory facilities and equipment, have developed to the point of requiring little further special effort. Thus, one can reasonably expect to devote more time to actual research, and less to such construction and maintenance details.

Progress in animal breeding, which is actually the only justification for the project's existence, has been modest. Nevertheless, it has made some small contribution to the general fund of knowledge of beef cattle breeding and improvement. Details are to be found in the publication cited at the end of this and previous reports, and need not be repeated.

The general areas of research **include:**

1. The number of progeny required to test a male for heterozygosity for a single autosomal recessive gene.
2. Muscular hypertrophy and black cutter beef.
3. A contribution to the study of dwarfism.
4. Phenotypic, genetic and environmental correlations between growth at different periods in range cattle.
5. Beef production from Holstein steers.
6. A comparison of group and individual feeding of experimental cattle.
7. Hereditary female sterility.
8. Bull indexing.
9. The relation between conformation and carcass quality in fat steers.
10. Compensatory growth of beef cattle.
11. Early allometric growth of beef cattle.
12. An evaluation of the antipyrene technique.
13. The use of blood glutathione as an indicator of growth potential.
14. The use of filter paper electrophoresis in dwarf research and in early pregnancy diagnosis.

Those studies from which conclusions have been drawn are cited in this and previous reports.

VI. Work Planned for the Future: Plans for the coming year are largely restricted to completing analysis of existing data and continuing work already initiated. Experience indicates that it is not possible to undertake and carry to completion all work one might envision. It is necessary, therefore, to restrict one's activities to those matters considered most important. Those items selected for most concerted effort during the next year include:

1. The relation of blood glutathione, and possibly other constituents to rate and economy of gain and size.
2. Allometric growth.
3. An evaluation of the relation between conformation and certain growth and production traits.
4. Histology and physiology of the Fallopian tubes.
5. Synchronizing the estrus cycle.
6. The use of filter paper electrophoresis to identify individuals heterozygous for certain dwarf conditioning genes.
7. The use of filter paper electrophoresis to determine early pregnancy.

VII. Publications and Manuscripts:

Bohman, V. R. 1955. Compensatory growth of beef cattle. I. The effect of hay maturity. J. Anim. Sci. 14:249-255.

Kidwell, J. F., J. A. McCormick, and L. O. McCartney. 1955. Bull indexing; your key to better calf crops. Nevada Agr. Expt. Sta. C. 6.

_____, 1955. A study of the relation between body conformation and carcass quality in fat calves. J. Anim. Sci. 14:233-242.

_____, Marven A. Wade, and J. E. Hunter. The relation of blood glutathione level to growth and body size in beef cattle. Manuscript prepared.

_____, and J. A. McCormick. The influence of size and type on growth and development of cattle. Manuscript prepared.

I. Cattle Inventory
A. Purebreds

BEEF BREEDING PROJECT SUMMARY
Fiscal Year 1954-55

State: Nevada
Date: June 1955

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Line designation	IR	IIR	IIIR	IK	IIK
Breed	Hereford	Hereford	Hereford	Hereford	Hereford
Station	Reno	Reno	Reno	Knoll Creek	Knoll Creek
Bulls (12 mo. or over)	2	2	2	3	2
Cows (2 yrs. or over)	25	24	24	22	23
Heifers, yearlings	5	4	5	4	4
Bull calves	8	7	5	3	4
Heifer calves	1	9	3	4	4
Percentage use for breeding project	95	95	95	100	100
Estimated cash value	8,450	8,400	8,150	8,100	8,100

B. Grades

Line designation					
Breed					
Station					
Bulls (12 mo. or over)					
Cows (2 yrs. or over)					
Male calves					
Heifer calves					
Percentage use for breeding project:					
Estimated cash value					

II. Young animals which were on feed during 1954-55.
A. Purebreds

	Herefords		Angus		Shorthorns	
	Number Individually Fed	Number Group Fed	Number Individually Fed	Number Group Fed	Number Individually Fed	Number Group Fed
Bulls	29					
Heifers	28					
Steers						

B. Grades

Bulls						
Heifers						
Steers	54 ² / ₁					

1/ One bull and three heifers lost due to bloat.

2/ Except for 7 Holsteins and a few steers showing some dairy type ancestry, these were predominantly Hereford.

New Mexico College of Agriculture and Mechanic Arts

- I. Station: New Mexico Agricultural Experiment Station, State College, New Mexico.
- II. Project Title: Breeding Beef Cattle for Southwestern Ranges.
- III. Personnel: R. L. Blackwell, J. H. Knox, and W. E. Watkins, and R. T. Clark.
- IV. Nature and Extent of Work Done This Year: The work done during the year included the collection of routine data on the range herd and the purebred herd. Two lots of steer calves were fed out for the type comparison study. Feed lot data and carcass data were obtained. Three lots of heifers were brought to the feed lots from the ranch and carried on stocker rations during the winter. Individual weights were taken monthly. These heifers were culled in May and the selected group returned to the ranch.

Weaning, yearling, feedlot, and carcass data on approximately 500 steers were tabulated completely and taken to Denver. These data are being processed by the IBM facilities that are available through Dr. Clark's office. From this analysis will come estimates of the effect of inbreeding, genetic and non-genetic variations and covariations for the traits studied.

All of the data pertaining to cow production on the range at the New Mexico Station were tabulated for IBM processing. A large body of data from a private herd is also now being tabulated.

Summarizations were made of cowproduction data, carcass data that we now have recorded, and a further study of the relationships between weaning and yearling traits in range heifers was made.

The effect of development of long yearling heifers (about 18 months) on their subsequent calf production on the range was made. Average weaning weights of calves raised the first two years by heifers which had been divided into four weight groups (1. over 700 lbs., 2. 650-699 lbs., 3. 600-649 lbs., 4. under 600 lbs.) showed a much lower calf production for groups 3 and 4 than for groups 1 and 2. In percentage of cows raising calves to weaning age the first three years the trend was for a gradual decline from group 1 to group 3, than an abrupt drop for the heifers under 600 pounds. By combining average calf weight and percent calf crop there was nearly equal production for groups 1 and 2 and then a steady decline for the smaller heifers.

Lifetime production of 33 compact cows and 38 large cows was summarized. The striking results of the effects of type and size on lifetime production of these range cows are shown in table 1.

These findings, associated with some of the correlation studies made previously, strongly point to the fact that at least one of the basic differences between the "compact" and "large" type cows is that of size at a given age. The most significant differences found in any of our type comparisons is that of lifetime production of cows on the range. It appears that size in itself at a young age (weaning or long yearling) is an excellent criterion for selecting range cows that are adapted to semi-arid,

southwestern ranges. Regularity of reproduction and the ability to wean heavy calves is undoubtedly a measure of adaptability to our conditions. Many of the records referred to in the above summary were made in years of extreme drought and possibly have tended to accentuate the adaptability of the large type.

A further comparison of compact and large cows in terms of calf weight per 1,000 pounds of dam (for cows that raised calves) shows the average weaning weight to be almost the same. When expressed as calf weight per cow in the breeding herd (considering calf crop) there was a difference of 100 pounds. When considering production per unit of feed eaten (weight of calf per 1,000 pounds of cow in the breeding herd) the difference between the two types was approximately 50 pounds. (See table 2.)

A preliminary study of the relative thyroid activity of the large and compact steers has shown no difference between the two types. From these limited data there were no significant correlations between relative thyroid activity and gains, dressing percent, thyroid weight, carcass grade, or feed lot grade. Oxygen uptake per gram of mouse for the mice injected with thyroid suspension from the two types of steers was more rapid than for the untreated mice. Treated mice were asphyxiated at the average rate of 2 minutes per gram body weight compared to 3.6 minutes per gram body weight for the controls. This indicated that thyroid activity was measured fairly well by the method used.*

The relationships between carcass measurements and visual appraisal of the live animal at the end of the feeding period was made. This study involved three lots of two-year-old steers and three lots each of large and compact type yearling steers. Intra-lot simple correlations were computed among 16 characteristics. An extension of this study is in progress in which estimates of genetic and non-genetic relationships will be obtained.

Bulls were profiled in February and the profiles were sent to Dr. Gregory. Progeny testing of bulls for a "lethal" characteristic has continued as fast as possible.

- V. Summary of Progress and Conclusions to Date: The data collected at the New Mexico Station have had considerable influence on the cattlemen of the state as well as many others elsewhere. It appears now that size (weight for age) is an important factor in the selection of range cattle for adaptability. The data on steers that have been fed and slaughter data obtained from them indicate that selection of size as it has been practiced here will produce cattle that do well in the feed lot and yield desirable carcasses. Further, selection for this important characteristic is easily accomplished by cattlemen.

* Burris, M. J., et al, 1953. Soc. Exp. Biol. and Med. 84:181.

Table 1. Effect of Type on Lifetime Production of Range Cows.

Type	Compact	Large
Number of cows	33.	38.
Average age removed from herd (years)	8.1	8.8
Total calving periods	201.	259.
Total calves born	174.	250.
Calving percentage	86.6	96.5
Calves died	10.	7.
Calves weaned	164.	243.
Calf crop	81.6	93.8
Av. No. of calves produced in life of one cow	5.0	6.5

Table 2. Relationship of Cow Production to Estimated Feed Consumption.

	Compact	Large
Cow weight, lbs.	934.	1,066.
Calf weight, lbs.	417.	469.
Calf weight/1,000 lbs. wt. of dam	448.	440.
Calf crop, percent	81.6	93.8
Av. calf wt./cow in breeding herd	340.	440.
Av. calf wt./1,000 lbs. cow wt. in breeding herd	366.	413.

VI. Work Planned for the Future: The collection of routine data on the experimental cattle will be continued as planned. Complete the tabulation of existing data for processing with IBM equipment and proceed as rapidly as possible with analysis.

Plans are being made to initiate a project to study factors affecting reproductive failures in beef cattle. Certain data from this project will be pertinent to the beef cattle breeding project.

Data from private herds will be collected when possible in order to give additional information for heritability studies.

VII. Publications and Manuscripts:

Allen, Elmer. 1954. Prediction of carcass merit from feed lot weight, feed lot grade, and type score. M. S. Thesis. New Mexico College of Agriculture and Mechanic Arts.

Blackwell, R. L. 1954. Weights, gains, and grades in the selection of range cattle. Ranch Day (Report) Oct. 11, 1954.

Knox, J. H. 1954. Breeding for modern needs. The Shorthorn World (10):40-41 406-407. Aug. 15.

Knox, J. H. 1954. The effect of the development of heifers on their production. Ranch Day (Report) Oct. 11, 1954.

1954. A plan of breeding for the range herd. 8-10.
Other factors to consider in beef cattle improvement. 11-13.
The effect of type on rate and efficiency of gain, early maturity, carcass excellence, and cow production. 16-18.
Growth of yearling steers and their production as compared with breeding cows. 129-130.
Developing heifers, and the effect of age on production by range cows. 131-132.
Selecting replacement heifers and culling the cow herd. 133-135.
Wash. State Col. Dept. Animal. Husb. Stockmen's Handb. 1954.

1954. The modern beef steer--what is he like? Cattle Feeders Day, Urbana, Ill. Nov. 1954. Published in The Shorthorn World, 39(16):7,70-71. Nov. 15, and elsewhere.

McCleery, N. B., and R. L. Blackwell. 1954. A study of the effect of mild inbreeding on weaning weight and grade of range calves. Western Section, Amer. Soc. Anim. Prod. Proc.

Romo, Anthony, and R. L. Blackwell. 1954. Phenotypic and genetic correlations between type and weight of range cattle at different periods. Western Section, Amer. Soc. Anim. Prod. Proc.

Knox, J. H. 1955. The steer of the future. Nat. Live Stock Prod. 33(4):8,24. Feb. 1955.

BEEF CATTLE BREEDING PROJECT SUMMARY
Fiscal Year 1954-55

I. Cattle Inventory
A. Purebreds

State: New Mexico
Date: June 1955

Line designation	Old Line	Out Cross Line	
Breed	Hereford	Hereford	
Station	Main	Main	
Bulls (12 mo. or over)	2	4	
Cows (2 yrs. or over)	14	41	
Heifers, yearlings	6	9	
Male calves	6	6	
Heifer calves	2	8	
Percentage use for breeding project	65	65	
Estimated cash value	7,800	19,200	

B. Grades

Line designation	Big	Medium	Compact
Breed	Hereford	Hereford	Hereford
Station	Main	Main	Main
Bulls (12 mo. or over)	0	0	0
Cows (2 yrs. or over)	28	52	24
Heifers, yearlings	6	17	2
Male calves	9	16	5
Heifer calves	8	14	5
Percentage use for breeding project	50	50	50
Estimated cash value	4,320	8,550	3,420

II. Young animals which were on feed during 1954-55.

A. Purebreds

	Herefords	
	Number Individually Fed	Number Group Fed
Bulls	8	0
Heifers	0	25
Steers	0	10

B. Grades

Bulls	0	0
Heifers	0	30
Steers	0	20

III. Additions of land, physical facilities and equipment during fiscal year 1954-55.

Item	No.	Actual cash value	Percentage use for beef breeding project	Remarks
Office for veterinarian		800	20	
Office equipment		700	20	
Refrigerator	1	200	20	

Oregon State College

- I. Station: Oregon Agricultural Experiment Station, Corvallis, Oregon.
- II. Project Title: Improvement of Beef Cattle Through the Application of Breeding Methods.

Sub-Project Titles:

Completed and Reported:

1. The Effect of Such Factors as Birth Weight of Calf, Suckling Gains, Age Put on Test, Weight on Test, and Score on Feedlot Performance (Union and Central Stations.)
2. The Effect of the Male Hormone (Testosterone) on Rate of Gain, Feed Efficiency, and Carcass Characteristics.

Sub-Projects in Effect:

3. The Development of a Selection Index for Improving Beef Cattle.
4. The Growth Pattern of Calves Differing in Rate and Efficiency of Gains.
5. The Relation of Nitrogenous and Carbohydrate Constituents of Blood and Urine to Rate and Efficiency of Gains.
6. Further Studies on Heritabilities of Production Characteristics in Beef Cattle.
7. The Relation of Body Scores and Measurements to Rate of Gain, Feed Efficiency, and Carcass Characteristics.
8. Application of Selection for Greater Rate and Economy of Gains on a Ration Composed Primarily of Roughage (Squaw Butte and Central Stations.)
9. The Development and Use of Inbred Lines of Beef Cattle.
10. The Relation of Feed Digestibility to Rate and Economy of Gain.

The sub-project numbers will be used as reference in all material included in this report.

- III. Personnel: Ralph Bogart, Hugo Krueger, A. W. Oliver, J. E. Oldfield, John Kaufmes, C. M. Williams, G. E. Nelms, A. A. Rasheed, D. A. Price, R. W. Mason, W. A. Sawyer, Warren Brannon, H. G. Avery, Cecil Pierce, E. N. Hoffman, R. T. Clark, coordinator.

IV. Nature and Extent of Work Done This Year: Branch station work is noted. Where no notation is made, the work is done at the Central Station.

3. Made a study of the relative importance of suckling gains, feedlot gains, feed efficiency and score. Obtained data on economic values from the Denver office of the Bureau of Agricultural Economics. Analyzed record of Frank Anderson (private breeder) and presented results to him as to which were his best-doing calves.
4. The following measurements were made on 4 female and 2 male calves of the Lionheart line each week from birth to a weight of 400 pounds and then at weights of 500, 600, 700, and 800 pounds: Head length, head width, height at loin, height at withers, chest depth, length from hocks to pins, length from shoulder point to pins, round measure from patella to patella horizontally, circumference of front cannon, width of chest, and heart girth. The same measurements were taken on all the other calves when they weighed 400, 500, 600, 700 and 800 pounds.

Studied the response of calves to weaning. How the calf adjusts itself to the weaning regime is being related to its previous performance such as birth weight, rate of gain, age, etc. Also, its response to weaning is related to subsequent performance with such traits as rate of gain, feed efficiency, etc., being considered.

5. Injected 2 grade Hereford heifers with testosterone, 1 mg/kg body weight/week, commencing at a body weight of 200 and 300 pounds. Made observations on rate of gain, feed efficiency, body development, behavior, digestibility, blood uric acid, urea, amino acids, hemoglobin and creatine and 17-ketosteroids of urine.

The following analyses were run on the blood of 4 female and 2 male calves of the Lionheart line each week from birth to a weight of 400 pounds and then at 500, 600, 700, and 800 pounds: Uric acid, urea, amino acid, hemoglobin, and creatinine. The same analyses were run on the blood of all other calves when they weighed 400, 500, 600, 700, and 800 pounds.

A study has been initiated to determine the excretion rate of neutral 17-ketosteroids of all performance tested calves. The excretion rate then will be correlated with rate and efficiency of gains.

6. Analyzed data by IBM in cooperation with Dr. R. T. Clark and Dr. C. E. Shelby on body measurements at 500 and at 800 pounds body weight. Genetic environmental and gross correlations were made relating measurements to rate of gain and feed efficiency. Heritability estimates of measurements and scores were made.

Analyzed records of Central Station as to source of the factors affecting suckling gains (rate of gain from birth to weaning), age of dam, time of birth, sex, year, and line differences were studied.

Initiated a study on the inheritance of body size in mice, and the effect of body size on reproductive performance and cost of production.

Initiated a chromatography study of blood, urine and feces for steroids.

Continued the study using rabbits in which the cytoplasmic material, maternal effects both prior to and following birth, and post weaning environments are held constant with genetics varying. New Zealand does are mated to bucks of Polish (2 to 3 pound mature weight), New Zealand (9 to 10 pound mature weight), and Flemish Giant (16 to 20 pound mature weight.) The young are studied for gains, feed efficiency, and body weight, growth curves, and weights of endocrine glands.

Continued study on blindness in the Angus cattle to see if the eye trouble is due to an inability of the animals to convert carotene into vitamin A. Eyes of cattle are being studied and carotene and vitamin A of the blood are being determined.

All calves that die or are born dead are examined very carefully for dwarfism; particularly the head is opened for hydrocephalus examination.

Cooperated with the extension personnel in profiling bulls to differentiate dwarf carriers from clean ones as a service to breeders. The profiles are taken by the extension men and keyed out in the laboratory.

7. Scored, measured and photographed, using a 6" grid behind which the animal stands, all animals at 500 pounds when they started on feed test and again at 800 pounds when they completed the feed test. Estimated importance of various items making up total score and determined variations in score due to differences in calves and differences due to men doing the score.

8. (At squaw Butte.)

Twenty-three weaner heifers from the commercial* herd and five from the breeding herd** were randomly assigned to rations 1 and 2. It has been the practice to assign an equal number of heifers from each source to each ration. This could not be done for this experiment since there was an uneven number of heifers from the breeding herd available. Therefore, from the breeding herd, 3 heifers were assigned to ration 1 and 2 heifers to ration 2. The balance of the heifers came from the commercial herd. A total of 14 heifers were assigned to each ration.

Ration 1 consisted of: 2 pounds concentrate (75 percent ground barley and 25 percent rolled oats), 1/2 pound of cottonseed meal and a full-feed of chopped mixed hay (25 percent alfalfa--75 percent meadow hay.)

Ration 2 consisted of: Full-feed of concentrate (75 percent ground barley--25 percent rolled oats), 1/2 pound of cottonseed meal and a full-feed of chopped, mixed hay (50 percent alfalfa--50 percent meadow hay.)

* Commercial herd refers to the herd carried on sagebrush range for summer grazing.

** Breeding herd refers to the one-sire breeding herd carried on meadow pasture for summer grazing.

The winter test period was initiated on December 14, 1953, and was terminated on April 18, 1954 (126 days.) The grazing phase of the study then extended from May 7, 1954, to September 13, 1954.

9. Bred cows to further the development of the three lines of Herefords and one line of Angus.

Feed tested all calves (both male and female) in the three lines of Herefords and the Angus line.

(At Eastern Oregon Station, Union)

Bred registered cows to production tested bulls to further the development of the line of Herefords.

Bred grade cows in one-sire blocks to registered (production tested) bulls to further development of both registered and grade herds.

Completed production testing of nine registered bulls and five registered heifers.

Initiated production feed tests on twelve registered bull calves and eight registered heifer calves.

Note: The following controls initiated last year were exercised on these calves now on test:

1. Each calf weaned at 210 days of age.
2. Each calf is put on an individual feeding basis at weaning and fed through a 60-day conditioning period. Individual feed consumption and gains are kept during this period.
3. After the conditioning period, each calf is fed through a 120-day test period.
4. The test ration is a complete cube, 3/4 inch in diameter, made up in the ratio of 1/3 alfalfa-grass hay to 2/3 concentrate.

Completed first phase of the weaner calf wintering-grazing research program which was begun in the fall of 1953.

Completed test measuring the effect of one injection of slowly absorbable testosterone on rate and efficiency of heifer gains.

Completed test measuring the effect of one implantation of diethylstilbestrol pellets on rate and efficiency of steer gains.

10. The determination of digestibility using the ratio technique is under way. All calves of performance test will be tested for digestibility at 500, 600, 700, and 800 pounds body weight.

V. Summary of Progress and Conclusions to Date:

At the Central Station

Heart rate seems to be related to rate and efficiency of gains. The better performing groups of cattle have a higher heart rate. Thus, Angus bulls averaged 106.8, Hereford bulls 105.0, Hereford heifers 102.0, and Angus heifers 101.0.

Bulls gain faster and require less feed than steers; and steers, in turn, are superior in this respect to heifers. It appears that a portion of this difference between the heifers and bulls is attributable to the male sex hormone. Testosterone at a dosage level of 1 mg/kg of body weight per week injected intramuscularly during the test period from a weight of 500 pounds to a weight of 800 pounds increased the rate of gain and reduced the feed necessary for making each unit of gain in both heifers and steers. Heifers treated with testosterone responded with a greater increase in rate and economy of gain over the control heifers than the testosterone treated steers over the control steers. The heifers were not brought up to the level of normal bulls, whereas the steers were. The non-masculinizing male hormone, Methyl androstenediol, had no significant effect on rate and economy of gain; therefore, it appears that rate and efficiency of gain may be associated with the masculinizing principle of the male hormone. Methyl testosterone fed to steers at the rate of 1.5, 2.0, and 6.0 grams per 100 pounds concentrate with the allowance of concentrate at 0.8 pound per 100 pounds live animal weight did not statistically increase rate of gain and feed efficiency but it did cause some masculinizing and did affect the carcass by increasing nitrogen and reducing fat storage. The variation in this group of steers was great which may account for gain and efficiency figures showing non-significance.

There seems to be little relation between rate or economy of gain and scores for conformation. This is encouraging in that it appears possible to secure good appearing cattle that are rapid and efficient in their production. The relation of rate of gain to feed efficiency is very close; therefore, the ranchers who select only for rate of gain will get a good bit of improvement in economy of gains also.

At the Squaw Butte-Harney Station

Larger cows wean heavier calves than smaller ones.

Correction factor of 1.29 pounds per day for adjusting the weaning weights of range beef calves to a constant age basis has proven accurate.

Cancer eye seldom, if ever, occurs in "red-eyed" Herefords.

Studies on selection showed that selecting for larger animals as yearlings would result in large adult animals and cows that raised larger calves to weaning. Heritability of yearling weight is sufficiently high that some progress from individual selection would be made; however, the use of additional information, such as records on progeny or other relatives would increase the effectiveness of selection for yearling weight.

At the Eastern Oregon Station

During a three-year period ending in June 1952, bull calves have averaged 0.29 pound per day increase in average gain-on-test, and have increased in efficiency of gain by an average decrease of 60 pounds TDN for each 100 pounds gain in live weight.

Statistical analysis of this three-year data shows the following:

With individually fed calves--

- (a) Birth weight had a significant effect on gain-on-test, and on gain-from-birth-to-the-end-of-test.
- (b) Weight-on-test had a significant effect on total gain-from-birth-to-the-end-of-test.
- (c) Age-on-test had a significant effect on gain-on-test.
- (d) Suckling gain had no effect on gain-on-test, economy-of-gain, or total gain-from-birth-to-the-end-of-the-test-period.
- (e) Neither birth weight, suckling gain, nor weight-on-test, or age-on-test had any effect on economy of gain during the test period.
- (f) There was a significant regression of economy of gain on rate of gain.

With group fed calves, the following facts were determined--

- (a) Birth weight had a significant effect on gain-on-test and total gain.
- (b) Suckling gain had a significant effect on gain-on-test and total gain.
- (c) Weight-on-test had a significant negative effect on gain-on-test and a significant positive effect on total gain.
- (d) Age-on-test had a significant effect on gain-on-test.
- (e) Neither weight nor age-on-test had any effect on gain-from-birth-to-the-end-of-test.

Major Results for the Year:

- 3. An index based on heritability and economic importance of the four traits; suckling gains, feed-test gains, feed efficiency, and score reveals that the former index in use at Oregon State College in which equal emphasis was placed on each of the traits was slightly out of balance. It appears that less emphasis should be given to score in the index.
- 4. The animal's response to weaning as determined by initial loss of body weight, time to regain weaning weight, time to adjust to constant rate of increase in weight, and by the food consumption during the first week could not be demonstrated as being related to this subsequent feed lot rate of gain or feed efficiency as at present determined during the period from 500 to 800 pounds. There is a marked individual variation in the ability of beef bull calves to adjust to weaning and to the beginning of stall feeding. The rate of gain from birth to weaning was not related to weaning response.

There was no relationship of the different criteria used to assess the response to weaning with the exception of the time required to regain weaning weight and the amount of weight lost immediately following weaning. These factors were positively correlated. The growth was linear both during the pre-weaning and the post-weaning periods, but the slopes of the growth curves were not the same for the two periods. Where calves have comparable pre-weaning conditions, a long period on feed prior to beginning the feed lot performance records is apparently unwarranted. Nevertheless, an adjustment period of two weeks is advisable.

A short 100 to 150-pound gain period taken from weaning may be of value when one is concerned not so much for individual accuracy of test, but rather for selection of the best performing group of animals. Such a case may be a rancher who wishes to test out a number of young animals from his herd and who might not be prepared or able to run a more precise test.

Better doing calves have a straight line growth curve during the period from 500 to 800 pounds body weight. Animals with less desirable growth rates during this period show a plateau in the growth curve before 800 pounds is reached. Heifers are more inclined to show the growth plateau than bulls. In bulls one can predict fairly well what the growth rate will be by the slope of the growth curve during the first 100 pounds of gain.

5. The factors of blood uric acid, blood amino acids, blood urea, blood creatinine, hemoglobin, rate of gain, feed intake, feed efficiency, and age, were considered for 35 Hereford calves of the two sexes and three lines from 500 to 800 pounds body weight. The growth patterns of all the calves were plotted on arithmetic graph paper and the growth from 500 to 800 pounds body weight was found to be linear. A diurnal cycle was established for blood uric acid, blood urea, blood amino acids and blood creatinine using 2 bull and 2 heifer calves. The cycle has a high point in midmorning and another in midafternoon, apparently associated with the activity of feeding.

Blood uric acid, blood amino acids, blood urea, blood creatinine and hemoglobin were considered for 2 heifer and 2 bull calves during the period from birth to weaning. All the blood factors increased during this period. Blood urea increased most markedly and it has been concluded that the calves were consuming insufficient energy and as a consequence were deaminating large amounts of ingested amino acids. All blood values were erratic prior to weaning indicating fluctuations in the environment. Following weaning, the blood values became very steady indicating a more uniform environment in the test barns. Blood uric acid shows line and sex differences. Certain individuals consistently show very high blood uric acid values suggestive of being under genetic control in their distribution. Blood uric acid is associated with feed intake possibly due to some blood factor increasing with feed intake which interferes with tubular resorption. It may be that the reaction of uric acid to allantoin has shifted under the influence of a factor associated with feed intake.

Blood amino acids show a sex difference and are affected by feed intake. It is suggested that amino acids or protein may be the factor interfering with uric acid resorption. Blood urea shows a sex difference which may be due to the shift from protein anabolism to fat anabolism in the females at a younger age than the males. Blood creatinine increases with age and is associated negatively with rate of gain. Hemoglobin shows line and sex differences and the effect of age. The age effect may be due to the reduced dilution of the blood by plasma proteins which decrease with decreasing relative growth rate.

It was concluded that the blood constituents studied were not capable of ranking animals as to their rate of gain, feed intake or feed efficiency. It has been suggested that the sex differences in rate and efficiency of gain are due to a greater effect in the males than in the females by testosterone which in part counteracts the effect of decreasing growth hormone output. The actual differences in efficiency are reflected in a greater protein anabolism and smaller fat anabolism in the male than in the female.

Testosterone-treated rabbits made significantly higher gains than those injected with estrogens. No significant difference could be demonstrated between treated and non-treated rabbits in regard to gains. There was no effect of the injected hormonal materials on food intake during this period. Likewise, there was no effect of treatment on efficiency of food utilization.

Testosterone, estradiol and stilbestrol administration caused a significant reduction in the weight of the testes but had no effect on the weight of the ovaries. The three injected materials had no effect on the size of the pituitary. Although injected rabbits did not differ from the control in regard to the size of the thyroid gland, a significant difference was obtained between both estrogen-treated rabbits. Those injected with stilbestrol had significantly smaller thyroids than those injected with estradiol. The adrenal glands responded in a different way in both sexes in regard to administered hormonal materials. In the males, testosterone and stilbestrol caused a non-significant reduction in the weight of the adrenal glands while estradiol caused a significant increase in adrenal weight as compared to controls.

All three hormonal materials caused a non-significant increase in the weight of the adrenal glands of females as compared to controls.

Livers from estrogen-treated rabbits (79.5 grams) were significantly lighter in weight than those from testosterone-treated rabbits (94.5 grams.) There was no difference, however, between control and injected rabbits in the average weight of the livers.

Apparently, the injected hormonal materials had no effect on the chemical composition of lean muscle or kidney fat of rabbits. Treated rabbits did not differ from controls in the amount of fat separated from the fore-quarters.

Palatability studies showed no effect of treatment on any of the characteristics studied except in one case in which stilbestrol-treated rabbits had a less desirable flavor of lean from freshly-cooked meat.

During the first 42-day period, castrated males gained more than intact males, while spayed females gained less than intact females. Furthermore, during this same period castrated males consumed more food than did the intact males, while the spayed females consumed less food than did the intact females. During the second 42-day period, however, females consumed significantly more food than did the males.

Carcass and endocrine studies at slaughter showed that females dressed significantly higher than males while males had a significantly higher percentage of skin, head, and legs. Castration resulted in a marked and significant increase in the female pituitaries. Furthermore, castration resulted in an increase in the size of the male thyroids but a decrease in the size of the female thyroids. Males had significantly heavier adrenals than females.

The chemical analysis of lean muscle and kidney fat showed that females had significantly more dry matter and more ether extractable materials in fresh and dry lean muscle, respectively, than males. Females also had more separable fat from the forequarters than did males.

Evaporation losses from fresh and frozen carcasses were higher for males than for females.

Palatability studies showed that intensity of aroma in fresh meat of males and intact animals was greater than aroma of fresh meat from females or castrated animals. In the frozen cooked meat samples, the flavor of lean was more intense in carcasses from intact males and spayed females as compared to that from castrated males and intact females.

At the Eastern Oregon Station

Injected slowly absorbable testosterone given at the beginning of the feeding period increased rate of gain and reduced feed costs. The aqueous material was superior to the oil suspension. The hormone was apparently used by the end of 60 days as no advantage was noted in the treated groups after 60 days. The injection of diethylstilbestrol into steers reduced the rate of gain and increased feed costs.

- 6 & 7. Some of the material on heritability of suckling gains, feed-test gains, feed efficiency, score and body measurements, is being processed for publication at the present time.

At the Squaw Butte-Harney Station

8. Heifers that are wintered on a more liberal feed allowance do not make gains during the summer equal to those which have feed intake restricted to a greater extent. However, in either group, the heifers which gain the most rapidly during the winter generally gain more rapidly during the following summer. This indicates that good-doing cattle can be identified on a given level of feed intake but that cattle of one level cannot be compared with those on a different level. No detection of differences in gaining ability can be made if conditions are so severe that little or no gains are made.

9. The lines of cattle at the Central Station and at the Eastern Oregon Station are improving in production traits in spite of the inbreeding. Some abnormalities are occurring.

There are marked sex differences in suckling gains and rate and efficiency of gains during the feed-test period from 500 to 800 pounds weight. No effect of sex is noticed in body measurements or scores.

The effect of age of dam on suckling gains or feedlot rate and efficiency of gains of calves is not as apparent in the Oregon data as in data from other stations. The indications are that selection of replacement heifers and the use of selected bulls has resulted in such a marked effect that younger selected cows are producing almost equally to older unselected cows.

In the studies on factors affecting suckling gains, it was found that birth weight, time of birth, and lines all showed a significant effect. The effect of age of dam approached significance.

It seems that when time of birth and birth weight effects were adjusted, effects such as sex, etc., were no different.

Appropriate correction factors are now being applied to data and heritability of suckling gains are being calculated.

10. Preliminary results indicate that a portion of the difference in feed efficiency between good-doing and poor-doing cattle is due to differences in digestibility.

Outlook:

At the Central Station

Do rapid-gaining calves convert feed into meat more economically by taking more nutrients out of the feed or by a more rapid rate of conversion which results in a lower maintenance cost? Do the more efficient animals have a lower metabolic rate?

Will the endogenous metabolism as measured from urine and blood analyses give us a clue to the differences between "poor doing" and "good doing" animals in the feedlot?

When does the change in the growth to the fattening phase of development occur and what is the relation of the change in the growth pattern to genetically different rates and economics of productions?

Data are now available for comparing heritability estimates calculated on the basis of parent-offspring regression with that of relating the variance of half sibs to variance of unrelated animals.

What is the relation of rate and economy of gain in the feedlot to the performance of the animals on the range?

Scores and measurements have been taken at 500 and 800 pounds, and on some of the animals complete carcass data have been obtained. We need to determine if the live animal scores and

measurements have a predictive value so we will know which ones to continue taking and which ones to discontinue.

At the Eastern Oregon Station

Selection for rate and economy of gain promises to show continued improvement in both of these characters in the registered line of Herefords at this station.

The wintering-grazing research with weaner calves just started is an attempt to answer the following questions:

- a. Should weaner calves in northeastern Oregon be full fed through their first winter and marketed as yearlings, or should they be wintered and carried through one grazing season to be marketed off grass as long yearlings?
- b. If they are to be wintered and sold off grass, what is the most efficient level of winter feeding for maximum utilization of that grass?
- c. What is the comparative value of northeastern Oregon grown roughages and grains for wintering calves at this predetermined level of gain?

Consideration is being given to the possibility of the following research with the grade herd at the Union Station:

- a. The effect of level of wintering on subsequent grazing performance of steers. This would allow the use of low cost roughage (waste) in winter feeding, plus a management study of irrigated pasture.
- b. Age and size of Hereford heifers at first calving and their effect on lifetime production of the animal.

The initiation of a program of this nature would mean discontinuing present feedlot testing of station calves, or the purchase of additional steer calves each fall for use in wintering and grazing trials.

Research with the inbred line of Herefords on improvement of beef cattle through breeding methods will be continued.

Practical Application of Results or Public Benefits:

Improvement has been made in rate and economy of gains in all four lines in the one generation of cattle covered by the Oregon Station even though inbreeding approaching that of half-sib matings has been practiced. The progress in rate of gain has been more striking than that in feed efficiency.

The registered line of Herefords at the Eastern Oregon Station has continued to improve in production while being handled under Eastern Oregon range conditions. This, plus the significant regression of economy of gain on rate of gain, indicates that a rancher in Eastern Oregon can improve both rate

and efficiency of gain by weighing calves at birth and weaning and selecting accordingly, with very little change in his methods of operation.

The administration of testosterone increased the rate and economy of gains, particularly in heifers. This indicates that with the use of the hormone more beef could be produced with less feed. Two studies are needed, however, to make this practical. One must first know that the hormone in the beef cattle is eliminated prior to slaughter so no harm will come to people eating the meat. The hormone must be administered in a form and way that will require the minimum of handling the animals. There is evidence that this hormone increases bone growth and nitrogen and water retention which means more muscle but reduced fat storage. From the standpoint of present human needs for more protein and less fat, one might see a real place for use of testosterone in the cattle fattening program.

Procedures have been worked out which are being put into practice by ranchers with the help and guidance of the Extension Service which are giving marked improvement in beef cattle production.

Several of the factors which influence feedlot or test performance have been studied so that we now know which ones influence performance most and can do all possible to standardize our test program properly as the dairy people have in their dairy herd improvement work. It appears now that the adjustment period of about a month between weaning and feed testing allows the test to be made with the minimum of pre-influence affecting it.

Many practical applications of results may be made of the material that has been put out in published form. One unpublished indication arising from results of the 3 stations - one using roughage with only a bare amount of concentrate, one using 2 parts good alfalfa hay to one part of concentrate, and the other using heavy concentrate-to-hay feeding. It appears that selection for the best-doing animal in each group leads to improvement. This shows the fact that selections for good feedlot performance can be made on a ration which will not be injurious to future production of the bulls and heifers because of overfatness.

VI. Work Planned for the Future:

3. Analyze data and determine heritability on the selection index used at the Oregon Station. Determine, if possible, if the relative proportion allotted to each of the four characteristics for which selection is practiced is justified.
4. Complete the study on changes in body measurements and blood constituents associated with the development of the animal.
5. Complete the study on changes in constituents of the blood as it is related to rate and efficiency of production.

Determine the normal physiology of the beef animal such as respiration rate, heart rate, blood pressure, and some other physiological characteristics and see if age, season, and sex influence these. Determine from figures already obtained if these physiological functions are closely related to rate and economy of gains.

Continue injecting two heifers with testosterone and attempt to breed them. Continue observations on growth rate, development, and behavior.

Make chromatograms of urine from all calves in the 4 lines at 500 and 800 pounds body weight.

Collect blood from all cows losing calves at birth or soon after and test the blood for presence of erythrocyte antibodies.

Have all animals in the beef herd blood typed, and study the inheritance of the blood types further, especially as they might be related to calf losses.

6. Continue the work on the use of rabbits and other laboratory animals as pilot animals in various genetic and physiology studies that may later be applied to beef cattle improvement.

Develop 5 lines of mice--two with selection for large body weight at 45 days of age, two with selection for small body weight at 45 days of age, and one with no selection. Selection in one of the large lines and one of the small lines will be for 45-day weight in both sexes. In the other large and the other small line selection will be for 45-day weight of the females--the males will be selected on the basis of the mother's 45-day weight. All mice will be individually fed except when males are in cages with females and before litters are weaned. All feed consumed will be measured.

Material will be published on genetic and environmental correlations and heritability estimates from analyses which have been completed by Dr. Shelby working at the Denver office on IBM.

7. Obtain photographs, scores and measurements on each calf at 500 pounds when it goes on feed test and at 800 pounds when it comes off feed test in both the Hereford and the Angus herds.

At the Squaw Butte-Harney Station

8. The plan for this work will be revised but work the coming year will be conducted as in the past. Data are to be analyzed for publication.
9. Individually feed all calves produced in the purebred Hereford and Angus herds, recording rate of gain and feed consumed from 500 to 800 pounds weight.

Cooperate with breeders both as individuals and as groups in keeping records to help in selection and in their feed testing programs.

Make matings to continue the three sub-lines of Herefords and one line of Angus.

Cooperate to the fullest extent with the branch stations, particularly in the analysis of data and in the making of breeding material available to them.

At the Eastern Oregon Branch Station

All registered and grade cows will be bred to production tested bulls to further improve the cow herd at this station.

Only enough bulls will be production tested during 1955-56 to assure adequate replacement of station herd sires. These will be selected at birth on the production records of dams and sires. The remaining registered bull calves will be castrated and added to grade calves for lot testing.

All suitable heifer calves, both registered and grade, will be kept and returned to the cow herd as replacements to build up cow numbers. All eligible heifers will be registered.

Replacement heifer calves are now being wintered at three levels of nutrition. These will all be bred at approximately 16 months of age and returned to the cow herd.

Considerable thought is now being given to studying different methods of selection of replacement heifers.

All heifers produced in 1954, 1955, and possibly 1956, will be kept as replacements. Only those with obvious defects will be culled. This looks like an excellent opportunity to do some "paper" selection that would have no detrimental effect on present or future calf research at this station.

Tentatively, the plan would call for a set of individual records that would provide the following selection information:

1. On the basis of an index evaluation,
 - (a) Select at weaning on birth weight, suckling gain, score at weaning age, and production record of dam.
 - (b) Select at 12 months on birth weight, suckling gain, 12 months' gain, score, and production of dam.
2. Using scales only, select on basis of size for age at weaning or 12 months plus production record of dam.

Because all of these heifers can be kept in the herd, the final evaluation would be a demonstration to show what would have happened if a producer had used any one of the proposed plans and culled accordingly.

As production records become available on these heifers, they would be used to supplement the various "paper" selection procedures demonstrated.

10. Determine digestibility of each animal put through the feed test and see what part of the rate and efficiency of gain variation is accounted for by differences in digestibility.

Complete the study on net efficiency and factors that affect it.

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Williams, Lloyd G. 1955. Performance in relation to weaning response in production tested beef cattle. M.S. Thesis, Oregon State College.

BEEF BREEDING PROJECT SUMMARY
Fiscal Year 1954-55

I. Cattle Inventory
A. Purebreds

State: Oregon
Date: June 1955

Line designation	Lionheart	Prince	David	Angus
Breed	Hereford	Hereford	Hereford	Angus
Station	Corvallis	Corvallis	Corvallis	Corvallis
Bulls (12 mo. or over)	5	8	6	8
Cows (2 yrs. or over)	19	18	18	23
Heifers, yearlings	6	5	4	9
Bull calves	6	9	7	8
Heifer calves	5	4	3	11
percentage use for breeding project	75	75	75	75
Estimated cash value	15,400	15,200	13,500	17,400

B. Grades

Line designation	Crow			
Breed	Hereford			
Station	Burns			
Bulls (12 mo. or over)	2			
Cows (2 yrs. or over)	60			
Male calves	13			
Heifer calves	30			
Yearling heifers	28			
percentage use for breeding project	70			
Estimated cash value	15,900			

II. Young animals which were on feed during 1954-55.

A. Purebreds

	Herefords		Angus		Shorthorns	
	Number Individually Fed	Number Group Fed	Number Individually Fed	Number Group Fed	Number Individually Fed	Number Group Fed
Bulls	19	0	8	0		
Heifers	15	0	9	0		
Steers						

B. Grades

Bulls						
Heifers	28					
Steers						

III. Additions of land, physical facilities and equipment during fiscal year 1954-55

Item	No.	Actual cash value	Percentage use for beef breeding project
Calving shed	1	2,000	17
Corrals and lots	1	2,000	17
Chute house	1	800	17
Scales and scale house	1	1,500	17
Barn completion	1	1,500	17
Bull	1	1,100	100

I. Cattle Inventory
A. Purebreds

BEEF BREEDING PROJECT SUMMARY
Fiscal Year 1954-55

State: Oregon
Date: June 1955

Line designation	Chandler								
Breed	Hereford								
Station	Eastern Oregon Livestock Branch Experiment Station								
Bulls (12 mo. or over)	12								
Cows (2 yrs. or over)	28								
Heifers, yearlings	7								
Bull calves	3								
Steer calves	9								
Heifer calves	10								
Percentage use for breeding project	100								
Estimated cash value	\$11,050								

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B. Grades

Line designation	Chandler								
Breed	Hereford								
Station	Eastern Oregon Livestock Branch Experiment Station								
Bulls (12 mo. or over)	0								
Cows (2 yrs. or over)	49								
Male calves	29								
Heifer calves	20								
Percentage use for breeding project	100								
Estimated cash value	\$9,710								

II. Young animals which were on feed during 1954-55.
A. Purebreds

	Hereford		Angus		Shorthorn	
	Number Individually Fed	Number Group Fed	Number Individually Fed	Number Group Fed	Number Individually Fed	Number Group Fed
Bulls	80					
Heifers		126				
Steers						

B. Grades						
Bulls						
Heifers		133				
Steers		53				

U. S. Range Livestock Experiment Station

I. Station: U. S. Range Livestock Experiment Station, Miles City, Montana.

II. Project Titles:

b-4-1-3 Testing Methods of Measuring Performance in Beef Cattle Under Farm and Range Conditions.

b-4-1-6 Development of superior strains of Hereford cattle.

III. Personnel: J. R. Quesenberry, R. R. Woodward, and C. E. Shelby and R. T. Clark.

IV. Nature and Extent of Work Done This Year:

1. 1954-55 R.O.P. bulls--Selected male progeny of 14 sires from 9 lines were tested. For the third successive year the Line 11 bull calves (reciprocal cross of Line 1 x Line 5 backcrossed to Line 1) were highest in rate of gain. The Line 13 calves (Gietz Line) were second highest. No cross-line matings were tested.
2. 1954-55 Progeny test--Calves from the 7 test herds were sired by bulls from 7 lines. This is the first time in which within-year comparisons have been made between as many different lines. Performance records to date are showing similar relative rankings for the bulls and for their progeny indicating no evidence of any specific combining ability with the predominantly Line 1 test herd.
3. 1954-55 Calf production--There appears to be a definite response to continued selection for optimum milk production in some of the newer lines. With the exception of Lines 5 and 13 all lines weaned calves in 1954 that averaged at least 400 lbs. at 180 days despite an unfavorable year. The newly acquired Line 13 has been found to have a large percentage of cows with excessively large teats and malformed udders. A number of cows are also low in milk production. The calving percentage in Line 13 was only 61.1 percent in 1954 and 64.7 percent in 1955.
4. Heritability estimates were completed from data collected in progeny tests during the period 1942-51. The following estimates were obtained--birth weight 72, weaning weight 23, gain in feedlot 60, final weight out of feedlot 84, efficiency 22, slaughter grade 42, shrink 91, dressing percentage 73, carcass grade 16, color of eye muscle 31, area of eye muscle 72 and thickness of fat 38.
5. A study was made to be published this fall on the incidence of vaginal and uterine prolapse in the station herd. Supplemental data were obtained from the herd at the North Montana Branch Station. Related portions of the two herds were studied and the overall incidence was found to be 1.7 percent at Miles City and .7 percent at Havre. There was evidence that the lower plane of nutrition at the Miles City Station may have been responsible for the higher incidence of prolapse. Significant line and sire differences were evidence of an hereditary susceptibility. Differences were not statistically significant between age groups of cows.

6. Immunogenetic studies were continued in cooperation with the University of Wyoming. The entire herd, exclusive of the replacement heifers, was blood typed this year. Some of the lines could be identified by blood type. Attempts to associate blood type with feedlot performance have not as yet been successful.

7. This station has furnished the Ohio Agricultural Experiment Station with two Line 1 bulls each year for a three-year period. These bulls are bred to randomized cow herds at the Ohio Station and their progeny compared with the progeny of bulls from the Nebraska Station as well as out-bred bulls selected by the Ohio Station. Results of these tests last year showed a lower type score at weaning age of calves sired by Line 1 bulls but the fastest feedlot gains and highest average carcass grades.

8. To date there have been two calves born in the Miles City herd that were classified as dwarfs. One calf was born alive in 1954 from the Line 5 herd. This year a stillborn calf from Line 4 was sent to the University of California for anatomical study and was diagnosed to be a dwarf. The sires of both calves profiled as carriers. Profilometer readings were obtained on all bull calves at 6 and 13 months of age as well as all 2-year-old bulls.

V. A Summary of Progress and Conclusions to Date:

The effectiveness of inbreeding as a method of improvement in beef cattle is still being investigated at this station. Although the combining ability of most of the lines has been measured, more cross-line matings will have to be made before definite conclusions can be drawn.

Selection for gaining ability has had little effect upon carcass quality. Some improvement in carcass value may result because of the higher proportion of lean thought to be associated with rapid growth.

The formation of new lines from superior cross-line matings, which are then backcrossed to the better parental lines or mated inter se, seems to have some merit, although only preliminary data have been collected thus far.

VI. Work Planned for the Future:

Present project work will be continued. Since carcass studies to date leave some doubt as to the effectiveness of carcass improvements through selection by present standards more critical carcass analyses are planned. Additional carcass measurements were employed during the past year.

VII. Publications and Manuscripts:

Woodward, R. R., J. R. Quesenberry, R. T. Clark, C. E. Shelby, and O. G. Hankins. 1954. Relationships between preslaughter and postslaughter evaluations of beef cattle. U.S.D.A. Circ. 945.

Koch, R. M., and R. T. Clark. 1955. Influence of sex, season of birth and age of dam on economic traits in range beef cattle. J. Anim. Sci. 14:386-397.

Shelby, C. E., R. T. Clark, and R. R. Woodward. 1955. The heritability of some economic characteristics of beef cattle. J. Anim. Sci. 14:372-385.

I. Cattle Inventory
A. Purebreds

BEEF BREEDING PROJECT SUMMARY
Fiscal Year 1954-55

State: Montana
Date: June 1955

Line designation	1	4	5	6	8	9	10	11	12	13	Total
Breed	Hereford										
Station	U. S. Range Livestock Experiment Station										
Bulls (12 mo. or over)	20	13	4	6	7	6	6	1	1	4	68
Cows (2 yrs. or over)	162	45	31	31	23	45	34	22	17		410
Heifers, yearlings	54	11	19	11	6	8	7	5		5	126
Bull calves	49	16	11	12	8	11	7	8	16	3	141
Heifer calves	38	14	9	12	8	14	13	10	15	5	138
Percentage use for breeding project	100	--	--	--	--	--	--	--	--	--	
Estimated cash value											225,300

B. Grades

Line designation	Grade										
Breed	Hereford										
Station	U. S. Range Livestock Experiment Station										
Bulls (12 mo. or over)	0										
Cows (2 yrs. or over)	217										
Male calves	83										
Heifer calves	76										
Percentage use for breeding project	100										
Estimated cash value											

II. Young animals which were on feed during 1954-55.

A. Purebreds

	Hereford		Angus		Shorthorn	
	Number Individually Fed	Number Group Fed	Number Individually Fed	Number Group Fed	Number Individually Fed	Number Group Fed
Bulls	80					
Heifers		126				
Steers						
B. Grades						
Bulls						
Heifers		133				
Steers		53				

Utah State Agricultural College

- I. Station: Utah Agricultural Experiment Station, Logan, Utah.
- II. Project Title: The Improvement of Beef Cattle Through the Application of Breeding Methods.
- III. Personnel: James A. Bennett, Doyle J. Matthews, Owen Asplund, Ted Bateman, A. Jr. Nyman.
- IV. Nature and Extent of Work Done This Year:

1. Continued the development of two lines of Herefords and one line of Shorthorns.
2. Collected routine data on birth weights and measurements, weaning weights and yearling weights on animals produced in the project.
3. Conducted ROP tests for rate and efficiency of gains by individual feeding tests with the more desirable bull calves and by group feeding with the heifer and steer calves.
4. Tested one Hereford bull for the dwarf gene on a group of 12 known carrier cows.
5. Investigated the value of paper chromatography and micro-biological assay for differentiating the genotypes ~~in regard to~~ the dwarf condition.

V. Summary of Progress and Conclusions to Date:

The development of two lines of Herefords and one line of Shorthorns by mild inbreeding accompanied by selection has continued. The inbreeding coefficient of the calves born in 1954 in one line of Herefords averaged approximately 11 percent. The coefficient of inbreeding is less than this in the other Hereford and in the Shorthorn line. The occurrence of dwarfs in the Herefords has retarded the line development to some extent.

Milk production in the Hereford lines is apparently responding to selections and weaning weights of calves are increasing. The Shorthorn calves are still heavier, however, than the Herefords by approximately 20 pounds at 190 days of age. The difference in weaning weights between the Herefords and Shorthorns is less than in previous years.

Analyses of individual feeding test data have shown that bull calves gain 0.66 pounds more per day than heifer calves and they gained 4.6 pounds more for each 100 pounds of total digestible nutrients consumed. Bull calves were also 113 pounds heavier at the end of the feeding period. Initial weight of the calf at the start of the feeding period (when started on test at a constant age) strongly affects the efficiency of gain. Age of dam does not influence rate of gain, efficiency of gain or final feedlot performance when proper adjustments are made for sire, sex, and initial weight.

Some interesting results have been obtained from studies conducted with urine samples in an effort to devise a chemical means of identifying carriers of the dwarf gene. From paper chromatography work, with samples

from a limited population, one spot designated locally as "14" shows possibilities of differentiating carriers and non-carriers.

Micro-biological assays have shown that urine from dwarf animals has a consistently higher concentration of glutamic acid than does urine of normal animals. The creatinine to glutamic acid ratio on a 24-hour collection basis showed a 1.5 average for dwarfs with a range of 1.2 to 1.8. Normal animals showed an average of 5.0 with a range of 3.0 to 12.8. No consistent difference between carriers and non-carriers was apparent.

VI. Work Planned for the Future:

1. Continue development of lines.
2. Collect and analyze data to determine factors affecting production characteristics.
3. Continue chromatography and other biochemical studies in an effort to identify genotypes in regard to the dwarf genes.
4. Conduct intensive metabolic studies to learn more concerning causes of differences in gaining abilities.
5. Investigate means of refining measures of efficiency of gains with particular emphasis on determining the body composition of live cattle.

VII. Publications and Manuscripts:

Bennett, J. A. 1954. Proper conditioning of range bulls will increase herd profits. The Shorthorn World 39(10):211-213.

Utah Agricultural Experiment Station. 1955. Performance testing studies with beef cattle. Utah Agr. Expt. Sta. Bul. 377.

BEEF BREEDING PROJECT SUMMARY
Fiscal Year 1954-55

I. Cattle Inventory

State: Utah

Date: June 1955

Line designation	1	2	3	
Breed	Hereford	Hereford	Shorthorn	
Station	Panguitch	Logan	Logan	
Bulls (12 mo. or over)	8	5	5	
Cows (2 yrs. or over)	38	29	32	
Heifers, yearlings	14	11	6	
Bull calves	14	11	13	
Heifer calves	16	8	12	
Percentage use for breeding project	100%	85%	85%	
Estimated value	14,350	10,375	10,675	

II. Young animals on feed during 1954-55.

	Herefords		Shorthorns	
	Number Individually Fed	Number Group Fed	Number Individually Fed	Number Group Fed
Bulls	10		6	
Heifers		20		6
Steers		7		3

III. Addition of land, physical facilities and equipment during 1954-55.

Item	No.	Actual Cash value	Percentage use for beef breeding project	
Metabolism Building	Under construction	35,000.00	20%	
Scale-livestock	Two	600.00	100%	
Cattle Squeeze	One	380.00	100%	

Washington State College

- I. Station: Washington Agricultural Experiment Station, Pullman and Prosser Washington.
- II. Project Title: The improvement of beef cattle through the application of breeding methods: (a) by selecting for economically important characteristics, such as body type, daily rate of gain, feed efficiency, birth weight, weaning weight, yearling weight; (b) by identifying these characteristics at an early age to use in the selection program.
- III. Personnel: M. W. Galgan, M. E. Ensminger, W. E. Ham, Extension Service, and cooperating breeders, and R. T. Clark.
- IV. Nature and Extent of Work Done This Year:
 1. Production Testing WSC Beef Cattle.
Birth weights and weights at monthly intervals were taken on all 1954 beef calves. The animals were individually fed an all-pelleted ration from weaning (7 months) to one year of age. Carcass grades were obtained on bulls which were slaughtered at conclusion of feeding trial.
 2. Bull Testing Program - county level.
Whitman County tested 45 bulls from weaning to one year of age for type, rate of gain, and feed efficiency.
 3. Individual Production Testing Programs.
In cooperation with the Extension Service, over 60 breeders are carrying out Production Testing programs on individual ranches, in which the calves are weighed and graded at weaning time, fed a growing ration for 5 months and weighed and graded at one year of age. Selection is based on rate of gain while in the feedlot as well as on type.
 4. Identifying characteristics (gaining ability and feed efficiency) of economic importance at an early age.
 - a. Relationship between hormone activity and performance in beef cattle.
Protein Bound Iodine:
Blood samples were taken from animals on test: (1) four times every 12 hours to establish diurnal variation and (2) at 14-day intervals to determine the average level of protein bound iodine in the blood.
Radio Iodine:
The animals on test were given tracer doses of radio iodine (65 MC to each of 46 animals on January 26 and 50 MC on February 27). The concentration of the isotope was measured in the thyroid gland in vivo by taking readings every 12 hours until maximum concentration was reached and then daily readings until no appreciable count was found.

- b. Some blood constituents as a possible indication of performance of beef cattle. Blood samples were taken (at the same time as radio iodine was administered) and hematocrit values were determined from each of the animals on test.

V. Summary of Progress and Conclusions to Date:

1. Production Testing WSC Beef Cattle.

The summary of the performance of 46 animals on the 150-day individual feeding test is given in the following table:

Summary of Ages, Initial Weights, Average Daily Gains and Feed Efficiency of WSC Beef Calves on 150-day Feed Test

Number of Animals	Ave. Age Begin. Test (Days)	Ave. Wt. Begin Test (lbs.)	Ave. Daily Gain (lbs.)	Pounds Feed per 100 lbs. Gain (lbs.)
12 Angus	216.4	457.4	2.03	629.7
7 Hereford	218.9	459.6	2.35	577.6
7 Shorthorn	218.3	438.6	2.55	611.7
26 Bulls	217.6	452.9	2.26	610.9
14 Angus	214.1	413.6	1.55	708.3
6 Shorthorn	217.7	399.0	1.99	654.1
20 Heifers	215.2	409.2	1.68	692.1

The average Federal grade on the bull carcasses was average Commercial.

2. Bull Testing Program by Counties.

The results of 45 bulls on 147-day individual feeding test in the Whitman County Bull Testing program are summarized in the following table:

Summary of Performance of Whitman County Bulls on 147-day Feed Test

Number of Animals	Begin. Test Ave. Age (Days)	Ave. Wt. Begin. Test. (lbs.)	Ave. Daily Gain (lbs.)	Pounds Feed Per 100 lb. Gain (lbs.)
18 Angus	226.6	522.3	2.42	683.8
16 Hereford	225.3	535.1	2.38	656.3
11 Shorthorn	227.6	522.5	2.21	711.5
45 Bulls	226.4	526.9	2.35	680.8

The county bull testing program gave the breeders an opportunity to evaluate their animals on the basis of feedlot performance as well as on the basis of type, when the animals were under the same conditions.

3. Individual Production Testing Programs

The breeders realize the importance of keeping records on performance and are using them in selecting the animals for improvement of their herds.

4. Identifying Characteristics of Economic Importance at an Early Age.

a. Hormone Activity

Protein Bound Iodine

Determinations for Protein Bound Iodine are not completed. There is an indication of a possible relationship between the level of Protein Bound Iodine in the blood and the rate of gain.

Radio Iodine

1. The concentration of the isotope in the thyroid gland reached a maximum on an average in 72 hours after the pellet containing I^{131} was ingested.
2. The maximum uptake varied with individual animals. The readings ranged from 630 to 1900 counts per minute and 530 to 1175 counts per minute at the two periods of measurements. The relationship is significant in the fact that animals with low cpm continue to have low cpm.
3. There was considerable variation in the calculated effective half life of I^{131} ; varying from 5.4 days to 11.4 days. The relationship between the rate of gain and the effective half life was not statistically significant ($r = 0.25$) but there was a trend with the longer half life being associated with slow gains.

b. Blood Constituents

The hematocrit values ranged from 34.8 to 46.0. The average values for the bulls was 41.8, and for the heifers it was 40.2. There was no significant relationship between the hematocrit values and the average daily gains.

In identifying the characteristics of economic importance, the possibility of combining the different criteria (PBI values, maximum uptake of I^{131} by the thyroid, effective half life of I^{131} , hematocrit value) into some type of index and relating it with the performance of the animal is being considered.

VI. Work Planned for the Future: Production Testing program with 1955 beef calves will be continued, in which gains and feed efficiency data will be obtained.

Further studies with protein bound iodine and radio iodine will be carried out to find a method of determining the rapid and efficient gainers. Isotope work will be used in blood and urine of animals on test.

VII. Publications and Manuscripts:

Galgan, M. W., M. E. Ensminger, and C. R. Kyd. Production Testing Beef Cattle in the State of Washington. Paper presented at the Annual Meeting, Western Section, American Society of Animal Production at Corvallis, Oregon, July 12-14, 1954.

_____, and M. E. Ensminger. Raising Beef Calves From Birth on Synthetic and Dried Whole Milk. Paper presented at the Annual Meeting, Western Section, American Society of Animal Production, and Western Division, American Dairy Science Assn. at Corvallis, Ore. July 12-14, 1954.

Galgan, M. W. 1954. Production Testing Beef Cattle in Purebred and Commercial Herds. Lectures presented to WSC Stockmen's Short Course, 1954, and printed in Department of Animal Husbandry, Stockmen's Handbook, 1954.

_____, M. E. Ensminger, and D. E. Foster. 1955. Wash. Agr. Expt. Sta. Cir. 264.

_____, and M. E. Ensminger. Raising Beef Calves From Birth on Synthetic and Dried Whole Milk. Manuscript prepared.

Ham, W. E., M. W. Galgan, and M. E. Ensminger. 1954. Protein Bound Iodine. 1954. Paper presented at the Annual Meeting, Western Section, American Society of Animal Production, at Corvallis, Oregon, July 12-14, 1954.

North, W. A. 1955. Production Testing Beef Cattle. Factors Affecting Rate of Gain and Feed Efficiency. M.S. Thesis presented to the State College of Washington, Pullman, Washington, June 1955.

Results of 1954-55 Whitman County Beef Cattle Production Testing of Beef Bull Calves. Whitman County Cattlemen's Association, Whitman County Cir. No. 3, April 2, 1955.

VIII. Inventory of Animals and Facilities:

BEEF BREEDING PROJECT SUMMARY Fiscal Year 1954-55

1. Cattle Inventory A. Purebreds

State: Washington
Date: June 1955

Line designation	1	2	3	4
Breed	Angus	Hereford	Shorthorn	
Station	Main	Main	Main	Main
Bulls (12 mo. or over)	5	6	3	
Cows (2 yrs. or over)	24	19	20	
Heifers, yearlings	14	0	5	
Bull calves	8	10	8	
Heifer calves	12	4	6	
Percentage use for breeding project	100%	100%	100%	100%
Estimated cash value	27,350	15,800	18,475	

2. Young animals which were on feed during 1954-55.
A. Purebreds

	Herefords	Angus	Shorthorns
	Number Individually Fed	Number Individually Fed	Number Individually Fed
Bulls	7	12	7
Heifers	00	14	6

3. Additions of land, physical facilities and equipment during fiscal year 1954-55.

Item	No.	Actual Cash value	Percentage use for beef breeding project
Nuclear Rate Meter	1	450	100%
Metabolism Stalls	4	800	100%

University of Wyoming

- I. Station: Wyoming Agricultural Experiment Station, Laramie, Wyoming.
Gillette Experiment Station, Gillette, Wyoming.
- II. Project Title: Improvement of Beef Cattle Through the Application of Breeding Methods.
- III. Personnel: P. O. Stratton, N. W. Hilston, G. P. Stroble, C. O. Schoonover.
Also permanent and temporary farm laborers and graduate students. R. T. Clark.
- IV. Nature and Extent of Work Done This Year:

At the University Farm, Laramie

1. Bred cows to further the development of the lines of Hereford, Angus and Shorthorn.
2. Scored, measured (heart girth, height at withers, depth chest, width shoulders), profiled, and photographed, using a 6" grid behind which the animal stands, all project animals at weaning last fall. All progeny were scored, measured, profiled and photographed again at the end of an 168-day feed test.
3. All progeny (male and female) in all lines were individually fed for an 168-day period. Bull calves were individually fed a ration of one part concentrate to one part alfalfa hay. Heifer calves were individually fed a ration of one part concentrate to one part alfalfa hay.
4. All progeny were bled and blood typed at the close of the feed trial.
5. Selections for replacement breeding stock were made on the basis of record of performance.
6. All progeny not retained for breeding stock were slaughtered and carcass evaluation obtained following recommended procedure for measuring and grading by Reciprocal Meat Conference, 1952.
7. Completed a comparison study of metabolic rate as measured by body temperature on normal calves, calves from known carrier cows, and dwarf calves.
8. In cooperation with Wyoming ranchers, young horned Hereford bulls (approximately 12 months of age) were profiled and duplicate profiles were taken at an older age.
9. Cooperated with the extension personnel in profiling mature horned Hereford bulls as a service to breeders. The profiles are taken by the extension men and turned over to this laboratory to be keyed out and returned to the cooperating rancher.
10. Profiled and bled at the U. S. Range Livestock Experiment Station, Miles City, Montana. Included in the study were all 1954 bull calves in feed test and heifer calves for 1953 and 1954. Duplicate profiles at 7 months and 12-13 months were taken on the 1954 bull and heifer calves.

11. A study of the significance of head form in Hereford heifers has been extended to determine the association, if any, between head form development and the dwarf factor and other economic factors.
12. Combining ability tests of Miles City Line 1 sires on an outbred and inbred population of Hereford females were continued.

At the Gillette Station:

1. Bred cows to further the development of the Hereford line to perpetuate an inbred line of cattle already established in the state.
2. Scored, measured, and profiled all project animals. All 1954 progeny were scored, measured and profiled again at the end of an 168-day feed test. All bull calves were fed individually; heifer calves group fed.
3. Selection for replacement breeding stock was made on the basis of ROP. Carcass data were obtained on all progeny not retained for replacement.
4. Continuation of high and low level protein supplement feeding of pregnant heifers.

V. Summary of Progress and Conclusions to Date:

The 1954 calves from the inbred X inbred matings averaged 11.5 heavier at birth, 6 lbs. heavier at Weaning, corrected to 180 days, 36 lbs. more gain on feed test and were equally efficient on feed test as the contemporary calves from the inbred X outbred matings. This year the rations for the bull performance test were reduced from a 1:2 roughage to concentrate ratio to a 1:1 ratio. The feed cost per cwt. gain was reduced; variation in performance was sufficient for a desirable test. Individual vs. group feeding of the test heifer calves at the Laramie station was studied; there was no statistical difference in gain due to the treatments. A body temperature study of dwarf calves vs. normal calves from birth until 2 months of age revealed no significant difference (Table I). Oral administration of desiccated thyroid tablets for two months had no effect on the treated dwarfs as determined by body measurements, (Weight, height withers, depth body, heart girth, protrusion, head length, head width, length fore cannon bone).

Table I. Mean Rectal Fahrenheit Temperature of Dwarf vs. Normal Calves.

Calf Designation	No. Animals	No. Records	$\bar{x}$ temp. total	$\bar{x}$ temp. 1:00 p.m.	$\bar{x}$ temp. 9:00 p.m.
Normal	7	1080	102.664	102.456	102.873
Dwarf	7	736	102.191	102.002	102.5002
Dwarf non-treated	3	180	102.146	101.944	102.328
Dwarf treated	3	180	102.294	102.157	102.433

Head form measurements and profile readings have been accumulated on approximately 500 young beef animals of both sexes from weaning age through two years of age. Approximately 200 head of these animals have been studied a second time at a six-to nine-month interval. On preliminary analysis these data indicate that the major head form change takes place between nine and eighteen months of age. There are distinct line differences of head form as revealed by the Miles City data. Complete tabulation of these data is being processed by the IBM facilities available through the Denver office to determine heritability of head form and association of head form with traits of economic importance.

Body measurements and performance data on progeny study bulls and heifers for the past three years were tabulated for IBM processing. This study will be a time constant study of body measurements comparable to the Oregon weight constant study. Complete listings for IBM processing of duplicate profiles of horned Hereford bulls from some ten cooperators and experiment stations have been sent to Denver for processing. This study includes readings on bulls at 9-10 months, at 17-18 months, and some at 24 months of age. Gross correlations of X_1 , X_2 , and X_3 values will be determined in an attempt to develop a diagnostic key for horned Hereford bulls at a younger age.

Requests by mail to all cooperators in the state for breeding test results on those horned Hereford bulls profiled by the Animal Production Department and Extension were sent out in early January. As complete a tabulation and summary of this information as possible will be made available at the July meeting.

A complete analysis of two years' carcass data on those individually test fed bulls and heifers not retained for the Gillette or Laramie breeding herds is near completion.

Information requested in resolution No. III passed unanimously by the committee at Miles City will be made available at the July meeting.

The calves from the Gillette herd were weaned on September 21, 1954, and trucked to Torrington Substation for individual feed test. This year there were 7 bull calves and 14 heifer calves available for study. The bull calves were fed a roughage to concentrate ratio of 1:1 in contrast to the two previous years' ration of 1:2. Although in this year's test the variation of gain and feed efficiency was less than in previous tests, there was sufficient deviation to properly test the inherited gaining and efficiency of bulls. The cost of feed per 100 cwt. gain was significantly less this year than both the 1951-52 and 1953-54 studies. A statistical analysis of the three years' work revealed the following. The within year correlation of feed efficiency to gain, holding initial weight constant was -.7269. Holding gain constant, the within year regression of feed efficiency on initial weight was .76 pounds; that is, each pound increase in initial weight required .76 pound more feed to put on the same gain during the 168-day feeding test.

At the Gillette Station:

Eight yearling heifers were randomized into two lots for breeding in summer 1954, and fed as follows during the 1954-55 winter feeding period. Lot I - mature hay and one pound 41 percent protein supplement, Lot II - mature hay and four pounds 41 percent protein supplement. Heifers fed one pound of

supplement daily gained 41 pounds per head on the average from 1-11-55 until 4-20-55. During this same period in the lot, fed four pounds supplement daily, the average gain per head was 105 pounds. This difference was significant at the 1 percent level. There was an average 4 pound advantage in birth weight of the calves from Lot II, yet no greater difficulties at parturition.

The University of Wyoming immunogenetics laboratory has processed blood samples from over 1700 animals. These animals are providing data for several different studies, including studies of the possibility of genetic associations between blood type and economically important characteristics such as rate and economy of gain, and the genotype at the dwarf loci as diagnosed by the profilometer. A study was conducted on the immunogenetic behavior of inbred lines of Hereford cattle. From this study it was determined that there is an apparent affinity for certain blood type formulae by some of the lines studied. This indicates a coincident selection for these formulae associated with the selection program being followed. The actual mechanism of association has not yet been determined. The breeding herds of the Oregon State College will be blood typed this summer, and will provide additional data for this study.

Immunization programs conducted by the laboratory have produced a total of 66 immune sera, 35 of which are iso-immune sera. These immune sera provide the source of reagents used in the blood typing test.

VI. Work Planned for the Future:

The collection of routine data on the experimental cattle will be continued as planned. Tabulation of existing data has been completed and processing by IBM and analysis will proceed as rapidly as possible. Head form studies will continue, collecting data from private herds and experiment station herds.

Plans have been made to initiate a project to study digestibility of feed-stuffs by progeny test animals using indicators.

VII. Publications and Manuscripts:

Mason, Robert W. 1954. An immunogenetic study of the Miles City (Montana) inbred lines of beef cattle. M.S. Thesis. University of Wyoming.

_____, and C. P. Stroble. 1954. A study of blood groups of inbred lines of beef cattle. West. Sec. Amer. Soc. Anim. Prod. Proc.

Schoonover, C. O. 1955. Color photography as a technique in carcass evaluation of rib-eye cuts. West. Sec. Amer. Soc. Anim. Prod. Proc.

Stroble, C. P., R. W. Mason, and N. W. Hilston. 1954. A study of the immunogenetic behavior of inbred lines of Hereford cattle. (Abs.) J. Anim. Sci. 13:963.

_____, and M. W. Glenn. 1955. A fatal case of bovine anaphylaxis. J. Amer. Vet. Med. Assn. Vol. 126, No. 939.

_____, and N. W. Hilston. 1955. An investigation of the relationship between blood type and economic characters in beef cattle. West. Sec. Amer. Soc. Anim. Prod. Proc.

I. Cattle Inventory
A. Purebreds

BEEF BREEDING PROJECT SUMMARY
Fiscal Year 1954-55

State: Wyoming
Date: June 1955

Line designation						
Breed	Hereford	Shorthorn	Angus	Hereford	Hereford (B. Grade)	
Station	Laramie	Laramie	Laramie	Gillette	Laramie (Dryer)	
Bulls (12 mo. or over)	2	3	2	3	2	
Cows (2 yrs. or over)	29	27	26	28	11	
Heifers, yearlings	8	2	2	8	1	
Male calves	13	13	9	17	9	
Heifer calves	14	11	5	9	1	
Percentage use for breeding project	100%	100%	100%	100%	100%	
Estimated cash value	11,000	10,925	8,700	8,850	2,680	

II. Young animals which were on feed during 1954-55.

	Herefords		Angus		Shorthorns	
	Number Individually Fed A. B.	Number Group Fed A. B.	Number Individually Fed A. B.	Number Group Fed A. B.	Number Individually Fed A. B.	Number Group Fed A. B.
Bulls	15 3		7		5	
Heifers	4 1	18 3	1	2	3	2
Steers	2					12

A. = Purebreds
B. = Grades

III. Additions of land, physical facilities and equipment during fiscal year 1954-55.

Item	No.	Actual Cash Value	Percentage use for beef breeding project	Remarks
Angus bull	1	650.00	100%	
Feed Bunks	3	500.00	100	
Corrals	3	100.00	100	
Fencing		800.00	80	
Water trailer	1	170.00	80	
Tractors (lease)	3	960.00	50	
Neck Chains		40.00	100	
Forage Harvester (lease)	1	305.50	70	
Manure Spreader	1	48.56	80	
Meat Lab Equipment		500.00	80	
Lean Meter	1	74.00	90	
Blood Lab Equipment		84.00	100	
Contura	1	45.00	80	
Ind. Feed Bunks	10	800.00	100	
Beef Equipment		28.00	100	

IV. Funds expended during fiscal year 1954-55.

Source	Amount Non-recurring Items	Amount Operating Expense	Remarks
9 b3		7,500.00	
BAI Funds		2,550.00	
State-controlled Funds	5,105.06	26,450.00	

WYOMING

Analysis of 1953, 1954, 1955 offspring of sires profiled clean++, carrier +d, or overlap OL, and of dams whose sires fell into similar classification or are of unknown classification.

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University Herd, Laramie

Gillette Substation Herd

		Number of progeny											
	Normal calves Sire classification by profile	Dwarf calves Sire classification by profile			Premature or stillborn Sire classification by profile			Died before two mos Sire classification by profile					
		+d	++	O.L.	+d	++	O.L.	+d	++	O.L.	+d	++	O.L.
Proven carrier cows	2	2											
Daughters of proven carrier bulls	3	11		2							1	1	
Daughters of bulls profiled +d	3	11		2							1	1	
Daughters of bulls profiled ++		5											
Daughters of bulls classification unknown	17	30						1			2	1	
Proven carrier cows													
Daughters of proven carrier bulls			6										2
Daughters of bulls profiled +d													
Daughters of bulls profiled ++													
Daughters of bulls profiled O.L.	4		4										
Daughters of bulls classification unknown			50										

Additions to and Discussion of State Reports

Arizona

Dr. Wayman:

We will start with Arizona.

Mr. Pahnish:

The report has been submitted to the Committee in Detail. Data have been accumulated over a period of six years and have been coded for IBM. Cow and calf production data are now on IBM cards through the cooperation of the Coordinator's office at Denver. Conformation and condition scores have been taken and will be coded.

Tentative plans are being made for a cooperative program on a three-year basis with the Apache Tribal herd at San Carlos, Arizona. This will afford an opportunity to test Miles City bulls.

A bulletin is in preparation outlining dwarf characteristics at different ages which depicts mode of inheritance, calls attention either to other types of dwarfism or possible modification of this same kind. This bulletin is planned for livestock people to bring the information to their attention since these facts can complicate their breeding programs, and to encourage them to make such instances known.

We will continue with the cooperative program between the Arizona station and the Boice ranches. We will continue with progeny testing of Hereford sires and building up the station herd. We will continue to take profiles on stock where we can follow through and get a progeny test. The information will be turned over to P. W. Gregory. In most cases of progeny tests we are finding there is something lacking that will not give as clear-cut a picture as we wish could be the case.

Work on dwarfism research during the past year has been primarily on consolidating existing data and preparing them for publication. Body measurements are being accumulated with the hope of distinguishing dwarf from normal at time of birth. It is entirely possible to wrongly diagnose phenotypes at birth.

A history of the dwarf herd at Arizona was submitted to the Journal of Animal Science.

Dr. Wayman:

Thank you, Mr. Pahnish. Is there any discussion of the Arizona report?

Dr. Clark:

What did you mean by that remark that some of the progeny tests were not clear?

Mr. Pahnish:

Not many will dispute the fact that dwarf characteristics are not too well identified at birth. There are many opportunities to confuse a dwarf with a normal animal. Some animals will die before they can be identified. Some animals may go along and develop without being recognized as dwarfs. We cannot prove that, but there will be disputed cases. Also, there are modifications. Any time we run a progeny test whether by ourselves or in cooperation with someone else we have to give everything careful consideration.

Dr. Stonaker:

If we cannot find what we are after we cannot be certain of matings.

Mr. Pahnish:

There are progeny tests that are working out all right. Once in awhile we run into complications, but where you do have those cases you also have quite a number of instances where you get a pretty complete progeny test without too much question involved.

California

Dr. Wayman:

I appreciate Mr. Pahnish's report. Dr. Gregory, will you present the California report?

Dr. Gregory:

Two projects contribute to the W-1 effort. One concerns hereditary deficiencies and one is a more conventional type project. Both are rather complete in the written report and I am not going to take time to review them.

There are two or three things I do want to elaborate on in view of the Arizona report. One concerns actual diagnosis of dwarfism. In our California report we mention that the anatomy people who have been working on this have found that in the short-headed dwarf there is a premature closure of the spheno-occipital bones in dwarfs which has occurred at ten months of age, or in some cases has happened at birth. If you have dwarfs, Dr. Julian would be glad to get the material and will send a report on it.

Progeny tests were mentioned in the Arizona report. I have felt for some time that there is something wrong with progeny tests. Part of it is tied up with identification of dwarfs, which indicates there might be some animals that are phenotypically normal but genotypically dwarfs. There are several phenotypes of dwarfs I am convinced in addition to autosomal recessive dwarfism and until we know the whole complete genetic basis for dwarfism we are going to have some difficulties in our progeny tests. By this time next year we hope to be able to tell you more about it.

Dr. Bogart:

How should specimens be prepared to send to California?

Dr. Gregory:

Pack them in dry ice and send them by air, and let us know they are coming. The head or skull and the fore cannon cut off at the knee are all that is necessary, although he would be glad to get the entire animal. There are other diagnostic characters he is working on and he can tell more from the entire animal.

Dr. Kidwell:

The other portion of the report indicates conflicting reports on protein-bound iodine.

Dr. Rollins:

Dr. Carroll did that work under the project that I am directing, so I cannot elaborate on it. All I can say is that he is attempting to confirm some previous studies and the results speak for themselves.

Dr. Kidwell:

How difficult a procedure is it?

Dr. Rollins:

Dr. Carroll did run into difficulty. He had a technician working on it and had to destroy the results and start over. That may indicate it is not simple.

Colorado

Dr. Wayman:

Any other discussion? If not, Dr. Stonaker will report on the Colorado project.

Dr. Stonaker:

We are still going ahead with the inbred and line crosses at Fort Lewis. The big differences appear to be in fertility.

Blood grouping work has been analyzed. We find a significant deviation in excess of expected antigen loss. Antigens are disappearing out of the lines faster than inbreeding coefficients would indicate. Heterosis may be having some kind of selective advantage, but I do not know that that would serve to explain the deviation. It still could be due to chance. Like Wyoming, we do not have any definite range between antigens and performance. They show the way in which these lines differ. They are segregating for antigens.

Forty to fifty heritabilities were computed. Marbling of sire groups is approximately the same--heritability of marbling seems to be zero.

We have x-rayed all calves at Fort Lewis this year in cooperation with Hazel. That information is going to be very interesting to all of us. The biggest single thing is that while Dr. Hazel has difficulty about ++ and +d genotypes, the technique does have possibilities in diagnosing dwarfs.

Dr. Hazel does feel that the spininess on the ventral side of the lumbar vertebra does identify dwarfs. If he is correct, we do have a method of identifying dwarfs in stillborn calves. Our indications are that the still-born calves are not dwarfs this year. Indications are that the viability of the snorter type dwarfs is low.

We made predictions on the lines, as we have done on the profilometer studies. In general, this vertebra picture and what we have predicted are in agreement. The Brae-Arden line all show spiny vertebra.

We have introduced a "control" group at Fort Lewis this year because we felt we needed something going on there to parallel what the rancher is doing in his herds. We are making semen tests on the bulls. Twenty-four percent showed mature semen at first test (8-10 months), 85 percent on second test (13 months).

We have continued the analysis of daughters of profiled bulls mated to profiled bulls, and have prepared the distribution (see supplement to annual report). No castration is done until bulls are off feed. Those bulls profiled at 13 months of age show highly significant differences. Thirteen-month bulls give impossible results to try to fit to any kind of diagnosis--to try to fit to the profilometer readings.

In cooperation with Dr. Howry of the University of Colorado, a somascope is being built which will be used with the Lean-Meter in trying to determine depth of fat.

Dr. Stratton:

On blood testing work with Ohio State you are finding line differences, which we found in the Miles City work. Dr. Clark might care to report on Stormont's work.

Dr. Clark:

I would prefer for the California men to report on that. You said antigens are disappearing faster than the coefficients would indicate.

Dr. Stonaker:

Coefficients of inbreeding would indicate that antigens would not disappear. In homozygotes they disappear faster than we would anticipate.

Dr. Clark:

That would appear to be the opposite of the California findings.

A discussion following the Colorado report was participated in by Gregory, Stonaker, and others.

Hawaii

Dr. Wayman:

Our project is simple in nature and is confined to the progeny testing of range livestock in an attempt to elucidate selection criteria as soon as possible. Ranchers have been generous in their cooperation. We started out with five cooperators but are down to four because one man died and the man who replaced him did not carry on the work. Two cooperators have seen benefits and have expanded their herds and increased the scope of the work as well, so we are able to get more data. On a range basis we have been able to show wide differences in sire groups under varying stages of nutrition. We started working out correlations, but they are so confounded by environmental conditions that they are going to have to be worked out in a way I am not quite sure of at the present time. I included a chart to show how wide a variation we have within our Territorial production. (Environmental differences shown on chart in annual report.)

In working out corrections we take weaning weight minus birth weight expanded to 240 or 305 days. We have not sufficient data yet to work out any further correction factors on our cow herds.

Dr. Bogart:

In regard to appropriate corrections on growth, we know that growth would not be a straight-line function up to 600 days. It would be up to about 900 pounds.

Mr. Flower:

I am interested in how the breeders are using this in application. Are they using tested bulls to produce bulls for the industry, or are they using progeny tested bulls directly?

Dr. Wayman:

They are using progeny tested bulls.

Idaho

Dr. Wayman:

If there are no more comments regarding the Hawaii project, Dr. Sierk will now give us the Idaho report.

Dr. Sierk:

The 1954 calf crop was the first at the Idaho station that came on a spring calving basis only and will serve as a starting point for our tests. The 210-day weaning weights are adjusted in a similar manner to Dr. Wayman's weaning weights. It is interesting to note the differences in weaning weights of calves we find in the family groups.

In the 1955 breeding season we are using, at least in the Hereford herd, yearling bulls for breeding, which is new for us, bred to relatively small numbers of cows.

There will be continued cooperation with breeders on performance testing. The past couple of days there has been discussion on growth studies and environmental effects. I do not feel we have been getting quite the performance that might be made by bull calves on individual feed. I am not saying reports from other stations are out of line--they are out of line as far as our stations are concerned. Could we exchange stock from station to station at weaning time to get a test on that? It would be interesting to us to see if we could check management practices or whatever it might be. We have always cautioned against comparing herd to herd and station to station.

Dr. Wayman:

The best test would be with identical twins, and we do not have enough of them. Some work has been done in New Zealand and Tahiti which shows marked differences in relation to environment.

Dr. Sierk:

Our plans also call for carcass studies. I hope we do not leave that out when it comes to discussion of performance. I would like to say that when we talk record of performance it is not rate of gain only, but includes carcass quality.

Montana

Dr. Wayman:

Fred Willson, from Montana.

Mr. Willson:

We are just continuing on with the work we have been doing, and there isn't very much new to report. The Montana Hereford Association has been cooperating with us for a period of years in selecting bulls to be used on a more or less show-type herd of cattle. The Angus association also appointed a committee and they provided us with a good show-type bull to be used on part of our Angus herd. We have already made preliminary arrangements to use the bulls resulting from these two selection procedures--showing versus production--on a commercial herd.

At the Havre station we are using three different lines. We take the two top indexed bulls from each line and they are mated to a randomized group of cows that are primarily Miles City Line 1 grade cows, as a tester herd. The data are all summarized in the tables we presented. In the recurrent selection program this year we didn't have quite the decided advantage in favor of the crossline groups over the Miles City Line 1 group as we had the previous year. Of course, most of you realize that when you are comparing anything with Miles City Line 1 stock you are using a pretty high level of comparison to start with. But we did get advantages again this year in our crossline steers in most of the comparisons.

The crossline replacement heifers are following along pretty much the same picture that we got in our crossline steers.

So far as carrying the work out into the field is concerned, we are getting quite a bit of interest from feeders all over the country on feeding the steers from bulls that have been indexed. The Extension Service is indexing bulls on the ranchers' own places. It is just a comparison within each herd only, and I think that is the only valid comparison we can make, anyway, on this indexing work. They can make some selection based on records rather than just visual appraisal.

U. S. Range Livestock Experiment Station

Dr. Wayman:

I will ask Ray Woodward to report on the Miles City project.

Dr. Woodward:

I believe I can generalize on a few of the points that we have brought into the report, and also I notice that one phase of our work that we initiated we failed to include. I am speaking of fertility tests. Along with a number of other herds operated under range conditions, the Miles City herd has not been unique in not having fertility problems. We started fertility testing all of our bulls this year--all of the yearling bulls that came off test as well as the herd bulls that would be reused another year. We obtained our semen through palpation.

Possibly further elaboration on our studies of vaginal and uterine prolapse might be worth mentioning. This is a problem that has a great deal of importance up in the Northern Great Plains area, and I think probably from Knox's report down in New Mexico it is also common to the Southwest. Our studies on prolapse quite closely parallel those of eye cancer. That is, we found both heritable and environmental factors influencing the incidence.

On our Record of Performance work to date I think you are all familiar with our attempt to associate our various measures of production and carcass quality. The results clearly indicate that selection for various measures of increased production has little or no effect on carcass quality with the exception of possibly gaining ability resulting in increased muscling. Success in the improvement of carcasses in other meat-type animals would lead us to believe that more effort is needed in beef cattle. We feel that increased length of body from the point of the shoulder to the hip would certainly result in increased percentage of the more valuable cuts.

Just a word on our dwarfism incidence to date. Thus far we have had only two calves that have been diagnosed as dwarfs, one in our Line 4 and one in our Line 5. Our Line 5 dwarf is now in California and is of the long-headed dwarf type. The other calf diagnosed as a dwarf was born this year in our Line 4. This was a stillborn calf. The sires of both of the lines that have given us dwarfs, that is the sires used in the herds, were both profiled as carriers. I might add that we have several other sires that we have had to use through necessity that profiled as carriers that

have as yet given us no dwarfs. The only Line 1 herd sire that we have ever used that profiled carrier gave us a number of calves last year that we are quite sure represented a lethal that has not been described in the literature.

I believe that is all I have to present. The balance of the information is available here in the report.

Dr. Wayman:

Any questions on this Miles City report?

Mr. Bennett:

You mentioned palpating these yearling bulls. Were you successful in getting semen samples from all of them?

Dr. Woodward:

Yes. These yearlings were palpated at 13 months, and in some cases we obtained satisfactory semen samples at 10 months.

Mr. Pahnish:

One question, Ray. Were these two dwarfs both the long-headed type dwarfs?

Dr. Woodward:

No. Apparently the second dwarf was conventional.

Dr. Stonaker:

Was he hydrocephalic? How about it?

Dr. Gregory:

Yes, he was. That calf was sent to California. This calf was hydrocephalic. I might say that our experience has been that both in Angus and in Herefords the same stock that will give rise to short-headed dwarfs will also give rise to long-headed dwarfs.

Mr. Pahnish:

We found that true, too.

Dr. Stonaker:

Ray, to what extent is your selection for performance characteristics being to some extent counteracted by your attempt to bring in herd sires that profile clean?

Dr. Woodward:

We have actually gone entirely on the performance record in our selection. We had some lines where we just had no opportunity to do otherwise.

Dr. Stonaker:

I'm very much interested in this comment you made about this matter of length of body as related to cut-out value. I gave a student the assignment of using cut-out values of cuts to try to find something in the live animal that was related to the value of the animal per 100-pounds of carcass, and we were surprised to find in this cut-out value a range of something like \$2.00 per hundredweight variation in cut-out value--that is, the loin times its value, the round times its value, and so on. I had had the idea that since in pigs the plumpness of the ham seemed to be associated with the ham index in the carcass value, the same thing might hold in cattle, that your California index on hind quarters--patella over height--might be correlated with cut-out value. It was correlated with the percent round carcass, but when you multiplied the value of the round times its price and the loin times its price for Choice beef, there actually was no association. So what he ended up with finally was that the ratio of the length over the depth of body gave a correlation something like .55 with cut-out value on those steers, or, in other words, they would finish out constant. The long, shallow-bodied steer had the highest cut-out value. It makes us wonder what we've been selecting for.

Nevada

Dr. Wayman:

Any other comments? Then we will have the report of Kidwell from the Nevada station.

Dr. Kidwell:

We'll just go through briefly what has been done. The basic project as it is set up consists of five lines of cattle. These at present are one-sire herds--three lines at Reno and two lines at the Range Station. The three lines at Reno consist of one line being selected in the traditional fashion--the animal husbandman, extension specialist, and the herdsmen pick out the cattle they like. The second line is being selected strictly on the basis of rate of gain during the test period, and the third line on the basis of economy of gain during that period. Two of the lines on the range station are paralleled at Reno--rate of gain and economy of gain. We just didn't have room to duplicate the third line. I think comparisons should be valid over a period of several generations.

Physical facilities have been improved materially during the past year with the completion of additional laboratories.

We did complete an analysis of some data relating to conformation and carcass quality in fat calves. The best physical measure that we could find of carcass quality as measured by carcass grade--we did not have cut-out values on those animals--was width of chest. We did not find the correlation between the round measurement over height of withers times 100 and carcass grade that Dr. Gregory and his associates reported, and I have no explanation. I suspect that we don't know how to take that round measurement, and that, of course, would explain why.

With regard to the reproductive aspects of the project, two medical doctors, Strand and Jones, published a report of a method of determining early pregnancy in the human. Dr. Weeth attempted to see if this method could be adapted as an early pregnancy test in cattle. He's gotten far enough to know that it cannot be adapted as such.

Dr. Weeth has started some rather detailed observations on pelleted feeds. He has found some interesting things with regard to the effect of grinding on the ration and the effect of pelleting. Apparently the animals on a pelleted ration, or at least those he studied, do not ruminate. Now, this would raise a question in my mind, if they do not ruminate on a pelleted ration this is not the normal procedure, and would genetic implications from those tests be valid. Another aspect of that question that he raised was this, maybe on a finely ground or pelleted ration they don't need to ruminate. So this is something that simply must be investigated further.

We conducted another experiment with 1954 yearling steers which were simply collected as yearlings and individually full-fed, half for 84 days and half for 104 days, selected to represent five different feeder groups. This experiment again was designed to study some of the relationship between feeder grade, rate of gain, economy of gain, slaughter grade, dressing percent, cut-out values, and so on. The only thing that has been analyzed from that particular experiment is this work on the relationship of blood glutathione to these traits.

We also completed this past year the study of the effect of type and size on rate and economy of gain which was reported.

Dr. Woodward:

Jim, what is the size of the lines?

Dr. Kidwell:

They are one-sire lines, between 20 and 30 cows in a line. There are about 24 or 25 cows now.

Dr. Stonaker:

I was very much intrigued with Jim's paper on Holsteins up at Laramie. I'd like to say on that that we encourage Jim to go ahead with that, particularly if some way could be worked out to eventually raise the Holsteins and Herefords under similar environmental backgrounds so that some kind of really valid conclusion could be made.

Dr. Kidwell:

Well, I suspect we've got our neck out far enough now that we will be morally obligated to go ahead.

New Mexico

Dr. Wayman:

I'd like to call on Dr. Blackwell to give the New Mexico report.

Dr. Blackwell:

The work done during the past year at the New Mexico station has been essentially the same so far as collecting the routine data is concerned. I spent considerable time getting data tabulated for IBM analysis. These data were taken to Denver early in February and some progress has been made on the analysis of them, although I have been unable to spend any time up there to help it along. From these data I hope to obtain estimates of the effect of inbreeding from various feed-lot carcass characteristics of these steers and genetic and non-genetic variations and co-variations among, I believe, some fifteen or sixteen traits involving different aspects of growth rate at different times during the life of the animals and certain carcass information that we had on them.

One new little "trial balloon" that I sent up this year, I did try to assay the thyroid glands of a number of our type steers from the 1953-54 feeding operation. There has been some consistent difference in favor of the large type in growth rate and that type of thing. The preliminary work that I did this past year indicates that there was also no difference in the thyroid activity as measured by this method. The control laboratory animals that we used, the mice, did show significantly different asphyxiation time compared to those that had been treated with the thyroid suspension. So, I believe we must have been measuring thyroid activity as the method is supposed to do, so if there was any fault in the application of it, it was certainly ours only and not the fault of the method.

Prof. Knox during the past year summarized a good bit of data in a very good fashion, I believe. Two things I would like to refer to in general--one was the relationship between the size of heifers at approximately 18 months and their subsequent calf production. He found that as size declined there was a decline in calving percentage and size of calf, and so on. So that is certainly one thing in favor of size of animals, and selecting for size I am sure is a very important thing. With regard to our type-size study, one of the keynotes of the New Mexico project is lifetime production of a number of cattle that had been selected on the basis of their type or size as the case may be at weaning age. Thirty-three compact cows completed lifetime production and thirty-eight large type cows completed lifetime production, and the difference in calving percentage and weight of calves was overwhelmingly in favor of the large type.

Our carcass study work is continuing rather slowly, perhaps, but we are beginning to collect a fairly sizable quantity of data and we have made some preliminary studies on relationships between various carcass merit and so on.

I should make one comment here--we profiled some bulls in February and sent the information to Dr. Gregory, and we are continuing to attempt to progeny test the bulls in our own herd for the characteristic which I term a lethal characteristic. I am going to cooperate further with Dr. Gregory in this work and try to find out as much as we can about it.

We are going to try to get additional information on some of the reproductive problems.

I might add that in addition to the steer data that I mentioned being tabulated by IBM at Denver I have gone back and taken all the data from the New Mexico station on cow production, which is rather extensive, and

it is now almost in shape to be punched, and one of our cooperating herds-- I have all the information from them and it is also being tabulated for punching. We have one more rather large herd in the state which is getting good information and those data are available to us. So, I anticipate that considerable of my time in the future will be involved in analysis of some of this back information.

Mr. Bennett:

In regard to your size-of-cattle study, the big difference came about due to differences in reproduction?

Dr. Blackwell:

Yes, I think that's right. Prof. Knox and I both feel that size of itself is extremely important, particularly under our conditions. We found that size is a good thing to have in the feed lot, as the Montana people indicated, and also out on these arid ranges. There is a definite positive correlation between size of dam and size of calf produced.

Dr. Woodward:

Over the years how well was your type stabilized? In other words, how much of an overlap group did you have in both cows and calves--what percentage, would you say?

Dr. Blackwell:

I don't know as I can answer for the calves, Ray. We actually have three groups of cows, an in-between group which pretty well eliminates the overlap between large and compact types. There has been some overlap as far as calves are concerned.

Dr. Woodward:

We ran into considerable trouble in our type study because the cattle originally selected for the small and large types diverged. In other words, our initial selection was not too accurate.

Dr. Blackwell:

Well, I imagine we'll find that same problem when we get a little more critical analysis of the data.

Dr. Stonaker:

Bob, when you take your steers from your large and compact groups do you intermix them in sorting them up for large-compact test trial in the feed lot or do the steers from the large cows go into one lot and the steers from the compact cows go into the other?

Dr. Blackwell:

The latter has been the case.

Oregon

Dr. Wayman:

We'll hear from Ralph Bogart of Oregon.

Dr. Bogart:

You remember several years ago when we met at New Mexico I made a report in which I talked about the selection index placing equal emphasis on suckling gain, feed lot gain, feed efficiency, and score. Later, I have accumulated enough data on our own material to do a little analysis and it appears from this study that we are not justified in letting score have equal weight in the index with those other things. In other words, about half as much emphasis on score would be a little better. Also, it would appear that we should increase our emphasis on suckling gains.

We have done quite a lot of work getting material ready for IBM. I want to express my thanks to both Dr. Shelby and Dr. Clark in this connection. We have four studies being made, one on body measurement, one on score, one on blood--our chemical constituents of blood and urine--and then we have a large mass of data at our Squaw Butte-Harney station which are being processed and sent in for IBM analysis at Denver.

We have been doing some work on the injection of female calves with testosterone. We are going to continue this and see if we can make them grow bigger than the mature weight of ordinary animals. These heifers did gain at about the rate of bulls, and one of the interesting things was that they changed color. They became very dark compared to the light color that our ordinary Herefords had and they had at the beginning of the test.

We have been doing quite a little bit of work recently on the excretion rate of 17-ketosteroids. There appears to be a very close inverse relationship there. The animals that kick out a lot of 17-ketosteroids are our poor-doers, and those that put out very small amounts are our good-doers.

We have been doing some work on selection studies with small animals, mice. Mr. Mason is working on that trying to see if we select for body size what changes will go along associated with the changes we make in body size.

We are doing quite a bit of work on paper chromatography. Mason has found that there is one spot that is very important. If he gets that spot it almost invariably means a poor-doer, and if he doesn't get it, about 85 percent of them are in the good-doing group.

I might say that we have been weighing each animal each week from birth until it weighs 800 pounds, and this year we decided we'd hold some on to see what they would do. We held them up to 1200 pounds and they did not show a break until about that time. They were about 15 months old at that time.

We've made quite a lot of improvement in our beef cattle over the years that we have been working. One of the things that struck me rather forcibly is that now our 2-year-old cows are raising calves that are equal to our old mature cows that we started with. We don't get the heavy birth weights that they do at the U. S. Range Livestock Experiment Station. I think 95 pounds is the heaviest calf we have ever gotten, and they'll average 70 to 75 pounds.

We have picked up marked sex differences on rate and efficiency of gain. We are contemplating doing an analysis on body composition of live animals.

This next year we want to emphasize the analysis of data and preparation of publications. We've got a rather tremendous backlog of data and we feel it is our obligation to get some of the material out so people can make use of it.

We will have a purebred sale at which we will sell some of our best-doing bulls that have profiled clean. We are using nothing but profiled-clean bulls and so far it hasn't interfered with getting good bulls. We are using yearlings in our Herefords that averaged 3-1/2 pounds gain per day and still profile clean.

Dr. Stonaker:

You are going on the yearling profiles then in your selection.

Dr. Bogart:

Yes, we are trying to get it at about 15 months. We find that 15 is more accurate than 12.

Dr. Woodward:

In your index do you use the same correction on weight, for example, weaning for all lines?

Dr. Bogart:

We have been, yes.

Dr. Blackwell:

Dr. Bogart, since there is a closer association between rate of gain and economy of gain, would it not be appropriate to take it into account some way in your index?

Dr. Bogart:

That's why I said that because of that it looks like we could de-emphasize score and emphasize suckling gain more.

Dr. Kidwell:

Ralph, I wonder--I don't know whether it is our data or just my feeling, but the fact that rate and economy of gain are associated, might it not be due to the fact that they are both associated with mature size? The animals that gain more rapidly are larger in mature size, consequently are gaining more rapidly. They are laying down more protein and less fat, and consequently are also gaining more economically.

Dr. Bogart:

In answer to Dr. Kidwell's question, I think there is no question at all but what the larger kind of cattle do grow faster and are more efficient,

and they do store more protein and less fat. Practically all of our lines are what I would call "big" cattle.

Dr. Gregory:

Ralph, when you seel these steers is there any discrimination by the packers because they are large? I assume they are larger than most cattle.

Dr. Bogart:

In answer to Dr. Gregory's question, we haven't produced any steers in our breeding work. We keep every animal as a bull. We feed test every bull and every heifer, and then make our selections on the basis of how they perform. However, when we have used these bulls on commercial cattle to get steers or when we do take some of our bulls over to the plant for slaughter we find that they do grade in the Good and Choice group at 800 pounds fed a ration of two parts hay to one of concentrate.

Further discussion of the Oregon report was participated in by Bennett, Willson, Price, Stonaker, Clark, and Blackwell.

The meeting recessed at 11:45 A.M., and was again called to order by the Chairman at 1:10 P.M.

Utah

Dr. Wayman:

We will now hear from Jim Bennett.

Mr. Bennett:

There are a few things I might add concerning our Utah report. We are developing two lines of Herefords and one line of Shorthorns at the Utah station and the breeding method is mild inbreeding accompanied by selection. We do have a few cases where the relationship is not high. Our Herefords have been rather low in milk production, and we have been paying quite a little attention to this and our calves are coming in at heavier weaning weight. I think this is not all genetic improvement by any means because we have eliminated the cows that have proved to be poor milkers and we still have the good milkers in the herd, but we do think we are making some genetic improvement, also.

We are calving practically all of our heifers as two-year-olds and carrying them on through and selecting on that basis of the first year production for weaning weight of calf, also. We have had dwarfs in our Herefords and we have deliberately maintained a tester group of cows for checking our yearling bulls. We have 12 known carrier cows. By that I mean 12 cows that have produced 12 calves that we classified as dwarfs. We have had some profiles read. Dr. Gregory read a few bulls. Dr. Roubicek came over and took profiles on our bulls one year and I have taken a few since. In general, the profile has worked fairly well for us. Two bulls that Carl classed as carrier bulls did prove to be carriers. We had the matings made before they were classified. We didn't deliberately mate them. Matings were made before their profiles were read, and we did get dwarfs from these two although one of them waited two years before we got the dwarf. We used him over because we thought he was clean, but he did give us a dwarf. We tested two bulls that we thought were clean on basis of profile. One of these, I think, was a borderline Class I. Both of these apparently are clean. They didn't give us any dwarfs on the carrier group and we have used them in the herd and we haven't got any dwarfs since then. We are testing a third bull that profiled clean again this year.

The other major effort on our project is concerned with paper chromatography as a means of identifying the genotype of cows in regard to the dwarf gene. We have one spot on the paper chromatograms that shows quite a bit of promise. We call it "Spot No. 14." It was present in one group and absent in the other group in regard to carriers and non-carriers. It definitely appears that at least two compounds are involved. We have run some tests on this but we haven't been able to identify the compounds yet.

The first work we did with paper chromatography the indications were that dwarf animals excreted a higher level of glutamic acid than normal animals, and this is borne out in our later studies. We were interested in glutathione but when we ran determinations on the urine we got practically negative results. Very little glutathione carries over in the urine. We hope to work on the blood after awhile, but thus far we have worked almost entirely on urine.

We went from there to total sulphur, and that work is just very preliminary yet but we think we might have some possibilities there.

In summary, I would say that we are still hopeful that our 14-spot may pan out and show us something as to identifying carriers and non-carriers. I think on the dwarfs that we have studied the glutamic acid--the creatine in the glutamic acid ratio--does tend to separate them from normal calves.

Dr. Wayman:

Any comment on the Utah report?

Dr. Bogart:

On the glutamic acid, what about the carriers?

Mr. Bennett:

We couldn't find any differences. In the first batch we ran we thought we had something, but later on we didn't. I didn't mention glycine. We tried glycine, also, without results.

Washington

Dr. Wayman:

Dr. Galgan will now report on Washington.

Dr. Galgan:

The work at Washington involves two main phases contributing toward the improvement of beef cattle. One involves the use of selecting for economically important factors and the other is identifying the economic factors at an early enough age to speed up a selection program. The work involves the use of a college herd in the taking of production records, the work of county bull testing programs, and the individual production testing programs as carried on at those individual ranches, and, lastly, the so-called fundamental work in connection with identifying some of these characters. Last year we had 46 animals on test. These were taken at constant age of 207 days and carried through a feeding period of 150 days on individual feeding basis. The ration used was an all-pelleted ration consisting of one part hay, and in this case the hay was all-grass hay, and the other two parts of the concentrate put together in a half-inch diagonal pellet. The interesting thing about that is the first two months we found that there was no digestive disturbance. But after this initial period of about two months we noticed disturbances in the digestive system. We added chopped hay and the animals had access to that any time they wanted it. It didn't require much hay to eliminate these disturbances. On the average these animals consumed about a pound of hay and some of them even less than that. But it did do away with the disturbance due to the all-pelleted ration.

In addition to the regular information, we carried the bulls until they completed the test and then they were marketed in order to get the carcass information. Before they were marketed a visual grade was placed on them. In general, grades were from Good to Choice. Yet the carcass grades obtained by the Federal grader gave us a grade of about an average Commercial. In other words, there was definitely discrimination on the carcasses due to the fact that they were bull carcasses.

As to the bull testing program on the county level, we have information on over 230 bulls that have been tested by this means. I have discussed this with Dr. Shelby, planning to work out a method of deciding how much weight can be placed in working out the index on the three main characteristics that were used--rate of gain, efficiency of feed utilization, and type.

As far as the individual production testing program on the individual ranches, that is receiving considerable interest. In fact, we have something over 60 cooperators who are doing this type of work.

Dealing with the identification of characteristics, we are working with protein-bound iodine and the use of radio iodine. The method used in determining this protein-bound iodine is a very involved technique. On the basis of the few samples that were done last year, there was an indication that there might be some relationship between the faster gaining animals and the amount of protein-bound iodine. However, from the information available to date on the limited number of samples, we are not too sure about that statement.

Now, the other part is in connection with the use of radio-iodine in the determination of the faster gaining animals. The amount of the iodine uptake in the thyroid was measured. Because of the technique involved, there is considerable variation due to the experimental errors, but the encouraging thing is that animals showing low counts could be repeated the second time.

We have also taken samples of blood and measured the hematocrit values with the hope that there might be something in this that would help us pick out these better-doing animals.

As far as the future work is concerned, we plan to continue this work of production testing both with the college herd and with the cooperative breeders, and then to further refine the technique of the use of radio-iodine not only in the amount of radio-iodine uptake in the thyroid but also the collection of urine and measuring the radio iodine in the urine.

I think that will summarize what we have in mind.

Dr. Wayman:

Any questions on the Washington report?

Dr. Bogart:

On your pellets, when you had trouble was the material finely ground before it was pelleted?

Dr. Galgan:

The material was fairly coarsely ground. We tried to make it as coarsely ground as was possible.

Dr. Bogart:

How tight were they packed?

Dr. Galgan:

I am not too sure about the tightness of the pack, but they were easily crumbled. There was no difficulty in crumbling the pellet.

Dr. Bogart:

It is interesting, but we haven't run into that trouble with our one-inch ground alfalfa where we put two parts alfalfa to one concentrate.

Dr. Sierk:

I wanted to ask Dr. Galgan about grades on the bulls before slaughtering. Is that by market people or by your own staff?

Dr. Galgan:

In this grading group we used Mr. Meyer, who is our meat specialist and who has worked very closely with the packer-buyer. His grade we felt

would be comparable to the market buyers'.

Dr. Blackwell:

Dr. Galgan, was the spread in carcass grade correlated with the spread in the live grades?

Dr. Galgan:

Pretty closely.

Dr. Blackwell:

Then the difference might be explained by the prejudice against bull carcasses.

Dr. Galgan:

Yes.

Wyoming

Dr. Wayman:

Dr. Paul Stratton will report for Wyoming.

Dr. Stratton:

I would like to summarize the progress we have made in the past year. First of all, for those of you who aren't familiar with the Wyoming station, we have three major beef breeds--the Herefords, the Shorthorns, and the Angus. We have just recently got on a spring calving basis and all of the progeny dropped are left as is, not castrated, and individually fed and performance tested. We also have ten head of Dryer cows which are an inbred line of beef cattle from the Gietz line of breeding which we have used for a test of combining ability between inbred x inbred matings vs. our inbred Miles City bull on our outbred Hereford cow population.

In the first year we have definitely shown that there is an increase in birth weight, weaning weight, and in gain on feed test of the comparison between the inbreds crossed on inbreds vs. the outbreds and inbreds. We found a slight decrease in variation in performance of our livestock when we fed a 1:1 ratio in contrast to our previous 2:1, but not enough so that we couldn't still make our selections on the basis of performance.

In a study not quite completed at the time of the meeting last year, we have the complete data now on temperatures of dwarf calves vs. normal calves. We found no significant difference between the temperatures of the dwarfs and normal.

Following the temperature study, we divided the dwarf calves into two groups. We fed one group a desiccated thyroid tablet and the other we kept as controls. We continued our temperature studies following this and took some body measurements. We had no effect after two months of this treatment in body growth or in temperature studies.

We have three IBM studies going at Denver, and I wish to thank Dr. Clark and Shelby for their cooperation on this work. The first one includes a body measurement study of calves at weaning time and again at the end of feed tests and these data will be fitted to performance data of these individuals on test. We feed to a constant age period while Oregon feeds to a constant weight basis.

The second problem we sent to Denver is that work we have been doing on a head form study in female Hereford cattle. We started to work with six-month old heifers, repeating our head form measurements at 12 or 13 months of age, and again at 18 months of age. We have taken these data on the University herd and also on the Miles City purebred cattle and one cooperator in the state has been very helpful on the project. Results to date are not conclusive, but it certainly is indicated that we are getting our greatest change in head form probably between the ninth month and the eighteenth month. These will be processed at Denver and we should have something by next year to report.

Also, we have our listings completed on a head form study of bull calves at different ages. In other words, repeat profiles on young bulls and again as mature bulls on some 500 young bulls. We hope to answer the problem that is confronting the majority of us on this 13-month of age profile reading. The correlations of the X_1 , X_2 , X_3 values at the various stages will be studied to see if those values are highly correlated or in what way we can associate the second profile with the first. We have sent requests to all the cooperators of bulls we have profiled in the state so we might have a composite result of breeding tests to check on the accuracy of the profilometer.

Also, I have made up the requested information on profilometer data on those individuals that were sired by bulls profiled as carriers and those that have proved carriers. (This information is with the annual report.)

I should mention that we are dehorning our calves at birth and I definitely found a difference in profiles taken on horned individuals and the individuals that had been dehorned.

Last year I retained the top performing bull sired by the known carrier bull and mated him to his half-sisters that I retained for the breeding herd. He had a discriminant function of 11 on the polled reading and I thought I would take a chance on him. This spring we got two dwarfs out of six heifers. But it wasn't such a bad move, after all. We did weed out two of those heifers that I wouldn't want to keep in the herd.

This year we were fortunate enough to be able to handle all the carcass work on the individuals on feed test at the AP laboratory at Laramie. We ran into some of the difficulties that Walt (Galgan) had on price differentiation on the bull carcasses. We are able to sell them at Laramie. There haven't been any kickbacks on this bull meat.

Mr. Schoonover has developed a technique of color photography for rib-eye. I think it might have merit in between-sire and within-sire comparisons and between-year comparisons.

In regard to our blood typing work, Dr. Stroble found line differences in the Miles City animals. We have yet to come up with anything concrete on association of performance with blood groups.

In regard to our work for the future, we plan to continue with our head form studies. We are not only taking profile readings but also taking the head measurements at the zygomatic arch and at a point we call the lower eye and at the tuberosity point. There is some indication in our Miles City work that we definitely have a difference in head form in the lines up there and also in those head form measurements that were taken.

Dr. Wayman:

Thank you, Dr. Stratton. Any comment on the Wyoming report? Any questions?

Dr. Stonaker:

I wanted to ask, on your Dryer cows have they been split two ways, or are they just being bred straight to the Gietz bulls?

Dr. Stratton:

No. They are being mated with the inbred bull from Miles City. I'm comparing the progeny from the purebred herd as an outcross-inbred mating as compared with an inbred x inbred mating, assuming the Dryer are inbred.

Dr. Wayman:

Any comments on any previous reports?

Dr. Woodward:

I have one addition to make to our report which I failed to include. We have a test set up with a Colorado breeder in which we are getting a comparison between two of our tested bulls with two bulls from the Crowe herd in California. These bulls are all being mated to cows on the F. R. Carpenter ranch at Hayden, Colorado, to a 30-cow herd each, balanced as to age of the cow. We hope to set up several tests of this kind in the future. We feel that testing of bulls from the inbred lines in the industry is one of the more important phases of our testing program.

Dr. Gregory:

I might say that the original Crowe herd was based on a herd that was developed about thirty years ago and the breeding in it is largely Donald Domino 26th breeding. They have kept good records and they have had a good show ring record, and they have had some cattle that stood up well in the sales. They are very progressive people and they keep very good records. They are one of the best breeders we have in California.

Mr. Willson:

That brings up the question of all these lines we've got at the various stations. Is there any plan in the future to try to get any of these tests of crosses under the same environment, or is that necessary?

Dr. Wayman:

I would say it is, but I'm not the one that's going to decide that question.

Mr. Bennett:

I think it's an important question. In some ways it is easier to develop a line than it is to test one. Is there opportunity in these herds where they are starting to ultimately test several other lines at the same time?

Dr. Wayman:

That is something we could probably work out in our test herds in Hawaii. We do have two operators who are running large herds, and I believe we can influence them to bring in test animals from different lines to be tested.

A discussion of type and size relationships was participated in by Bogart, Bennett, Woodward, Clark, Stratton, Rollins, and Stonaker.

A discussion of the effects of stilbestrol feeding and its possible impact on performance testing was participated in by Willson, Wayman, Stonaker, Clark, Sierk, Wheeler, Kidwell, and Flower.

The meeting recessed.

The business meeting of the W-1 Technical Committee was called at 2:45 P.M., July 13, 1955. All committee members were present with Dr. McKenzie and Dr. Roubicek visiting.

The following Resolutions Committee had been appointed out of meeting: Dr. C. F. Sierk, Chairman; Dr. P. W. Gregory, and Dr. M. W. Galgan.

The meeting was called to order by the Chairman.

Dr. Wayman:

The question has been asked as to why Mr. Grandstaff, Dr. Byerly, and Dr. Clark were not asked to talk in the open meeting. Mr. Grandstaff preferred to speak in the closed meeting.

We will proceed to the order of business. Is there any old business on the agenda? The report of the subcommittee is in the form of the agenda for the Workshop.

Dr. Bogart:

The joint meeting with the Extension workers is at 7:00 this evening, and tomorrow we work in the Workshop, and right on through the week.

Dr. Wayman:

I have asked Dr. Sierk to act as Chairman of the Resolutions Committee and to present the resolutions tomorrow. That will give him an opportunity to meet with his committee.

I do have one new piece of business--an invitation from California to hold our meeting at Davis next year. I will read a letter from Dr. Gregory:

Several members of the Technical Committee of the W-1 project have mentioned that they have never met at the California station and indicated that a meeting should be held there.

The California station would enjoy being host to the W-1 Technical Committee, and it is a pleasure to extend a cordial invitation to the group to hold the 1956 session at the University of California at Davis.

Dr. Kidwell:

I make a motion the invitation be accepted.

Dr. Bogart:

Second.

(A discussion as to the time of the meeting was participated in by Stonaker, Kidwell, Bogart, Gregory, Wayman, and Sierk.)

Dr. Stratton:

I move we hold the meeting after the Society meetings.

Dr. Wayman:

Do you wish to amend the motion that we hold the meeting at Davis within convenient driving time after the Nevada meeting?

Dr. Sierk:

I second the motion.

Dr. Kidwell:

Are we to vote on the motion and the amendment simultaneously?

Dr. Wayman:

The first motion was reworded.

It is proposed that we accept the California invitation for 1956, with the meeting to follow as soon as possible after the Reno meeting--proposed by Kidwell, seconded by Bogart. Are you ready for the question? Vote carried.

Dr. Sierk:

How long will the meeting be?

Dr. Wayman:

That will have to be worked out by the committee. The length of the meeting will have to be decided by the Program Committee.

Dr. Bogart:

We would start Thursday, July 19, 1956.

Dr. McKenzie:

What about a proposal to the Program Committee of the Western Section regarding the possibility of the Regional Technical Committees including W-1 sending a representative or representatives to meet with the Extension people and others who may want to come to the Wednesday afternoon conference to carry the research to the field? I am all for getting this out to the field? I am all for getting this out to the Extension people. I don't think you can make them drink, but you can get them interested. If W-1 and W-4 would get in on a program to help get it out it might be a constructive job. It is important that some of the people stay over for the Wednesday afternoon meeting if this materializes.

Dr. Wayman:

I do not remember the exact wording in our resolution last year, but we went on record as inviting the Extension Livestock people from each state to attend the W-1 Technical Committee meeting.

Dr. Wheeler:

Dr. McKenzie has hit on a very important point. Now and then I am fully convinced that Extension people do not understand what it is all about.

Dr. Wayman:

That was discussed last year and the resolution passed.

Dr. Kidwell:

That was accomplished, and I believe it was at the February meeting the Extension Directors considered this resolution and agreed that the Extension Animal Husbandmen be urged to attend. I think it would be a good idea to remind the Directors again.

Dr. Wheeler:

It would be a good idea to send a copy of the letter to the Directors to the Extension Directors, also.

Dr. Wayman:

Should we get it into the minutes that the Livestock Specialists be invited to attend the report meeting?

Dr. Kidwell:

They should be invited to everything but the business meeting, which should be closed.

Dr. Wayman:

We will leave it to the Executive Committee to work out the details.

Mr. Willson:

The requests for Extension Specialists to attend the W-1 meeting will have to be out earlier than they were this year.

Dr. Clark:

Notice was sent out May 2.

Dr. Wayman:

It should have been in their hands in plenty of time.

Dr. Kidwell:

I am sure it was.

Dr. Wayman:

That suggestion is taken care of. We have decided on our meeting beginning July 19, 1956, at Davis, California.

Is there any further new business to be brought up?

Dr. Kidwell:

The first W-1 Technical Committee I attended was at Las Cruces in 1951. A group of special committee reports impressed me. We should have a committee to study the subject of carcass merit and all its ramifications and report to the group next year. We are approaching the point where we can give consideration to developing selection indexes which can be taken to the field as rough guides. The feeling is that we cannot develop selection indexes that will solve all problems. There might very well be a committee to consider the development of a selection index. Another suggestion is terminology. We still talk of efficiency of feed utilization when we mean pounds gain per pound of feed consumed or pound of gain per TDN. I think there should be a committee to start standardizing terminology. We talk about different things in different words.

Dr. Bogart:

We gain a great deal by having a functioning committee to bring these things before the group. I think it is a good suggestion.

Dr. Wayman:

Any comments or motions on that subject?

Dr. Stonaker:

Will this depend on whether we have a Workshop next year? This index is going to be worked on this year.

Dr. Wayman:

Dr. Kidwell has mentioned carcass evaluation and nomenclature for our projects. I think they are separate and distinct subjects apart from the selection index.

Dr. Bogart:

Before we discuss that, should we decide whether we will or will not have a Workshop next year?

Dr. Woodward:

Wouldn't the conclusion of the Workshop be a better time to decide that?

Dr. Sierk:

I am not speaking against the Workshop--I think it should be gratifying to all that it has come into being. I think the things Dr. Kidwell has brought up should be considered in the Technical Committee meeting. Many of the members will not go on through the Workshop. In effect, with the Workshop you are making a seven- or eight-day Technical Committee meeting.

Dr. Clark:

I think if we have a Workshop every two or three years that will be adequate for the purpose.

Dr. Bogart:

If that is the general consensus, I would move, then, that we have committees set up to bring in reports.

Dr. Wayman:

In specific form.

Dr. Bogart:

I move that the Chairman appoint the necessary committees for bringing reports to the Technical Committee next year, leaving it to the Executive Committee to decide the subjects to be covered.

Dr. Wayman:

You have heard the motion.

Dr. Woodward:

Second.

Dr. Wayman:

We should definitely outline the areas the committees are to explore:

1. Carcass evaluation; 2. Nomenclature; 3. Index selection.

Dr. Byerly:

Exploration of the field of gene interaction.

Dr. Bogart:

I move that we accept this fourth subject.

Dr. Woodward:

Seconded.

Dr. Wayman:

Four committees. Are you ready for the question?

Dr. Sierk:

Question.

Dr. Wayman:

Motion carried.

Dr. Kidwell:

I heard Dr. Bogart mention mice in his report this morning. We have at our station a small project with rats designed to study gene-environment interaction.

I am not interested in making any change whereby we could assign W-1 funds to this project, but can it be considered, in a sense, contributing to but not an integral part of W-1--something of that sort? Would there be any advantage to be gained?

Dr. Byerly:

So far as I am concerned I have no objections except availability of funds. The use of laboratory animals to study large livestock is sensible so far as a pilot project is concerned.

Dr. Stonaker:

This does open the question of considering pilot trials with laboratory animals. That is a fine thing. We have had sometimes the feeling that should be frowned upon, and the interpretation here is that it might be encouraged.

Dr. Sierk:

This does open up the fact that these could be contributing studies. Are they organized as future projects?

Dr. Gregory:

Is your W-1 project on a broad enough basis so you can do this without having a subproject?

Dr. Sierk:

Should it be included in the regional project?

Dr. Bogart:

Suppose you have to make a biological assay of the endocrine of beef cattle, do you have to use beef cattle?

Dr. Clark:

No.

Mr. Grandstaff:

Just a very short time ago the Office of Experiment Stations approved a project where rats were used in the study of breeding methods, so that should lead to the assumption that OES will approve such a project.

Dr. Sierk:

Is that the prerogative of the Executive Committee?

Dr. Clark:

Yes.

Mr. Grandstaff:

Yes. Dr. Clark made a very good point in saying it should be written up to show it is a contributing project. There is a tendency to broaden the base of W-1. The question may be asked as to whether it would strengthen W-1.

Dr. Clark:

The trouble in the past is that in many cases the connection has been described in a very tenuous manner, where there was no clear-cut contribution to the regional project as such.

Dr. Byerly:

When Don Warren started out he felt the need of a pilot project to compare breeding selection, and built random inbred lines. The first grant of money was from the Rockefeller Institute. The second grant of money was from the National Science fund. Since then housing has been furnished by Purdue University but otherwise the work has been supported by Government funds. If a project of this sort is justified as a national effort, the justification must be clear-cut.

Dr. Wayman:

The thing for Kidwell, then, is to write up his work and submit it to the Technical Committee if he wants to include it. Anyone else wishing to do so can follow the same procedure.

Dr. Stonaker:

The National Research Council has a new committee on Animal Breeding and Genetics. One thing to undertake would be brochure on suggestions of logical areas of research that might be undertaken in the area of farm animal improvement so the information might carry a little more weight with the organization of the National Research Council and experiment Stations. I am sure we cannot come to a W-1 meeting without getting ideas we would like to work on but which are beyond our scope. In addition to the ideas we have talked about, are there any others this group would want to send to that group, the idea being to bring to this National Research Council committee suggestions concerning possible research in large animals in the area of breeding and genetics.

Dr. Sierk:

Would you like to include fertility problems?

Dr. Stonaker:

I was thinking of the three problems discussed at the Society meetings.

Dr. Clark:

There is need for real research on in vivo body composition.

Dr. Gregory:

In regard to gene and environmental interaction, I think we all should realize in our domesticated animals there has been a tendency not to analyze the animal genetics. Classical genetics has been practically disregarded in our animals. We are being faced with problems that are classical genetics and I think more attention ought to be directed to classical genetics. The people who had charge of our flocks and herds in the experiment stations felt it was so costly to maintain herds for gene analysis they did not make any studies of the specific genes as they came along. Outside of Stonaker's study of compress, no one has made an adequate study of that gene. We are starting in on quantitative genetics, and when we start in with quantitative problems we put the cart before the horse and we are going to have to pick up and work out the qualitative genetics. Basic research has not been done as it should be done in our flocks and herds.

Dr. Wayman:

Is there any other new business?

Dr. Stonaker:

Does anyone want to take this to the National Research Council?

Dr. Wayman:

Will anyone make a motion that we draw up a resolution to the Council?

Dr. Bogart:

I move that the incoming chairman appoint a member of this Technical Committee to draw up concrete recommendations that would be provided to Dr. Stonaker by September 1 to go to the National Research Council.

Dr. Sierk:

Second.

Dr. Wayman:

The motion has been made and seconded that a member of this Technical Committee be appointed to draw up a recommendation to the National Research Council before September 1. Motion carried.

Dr. Wayman:

The remarks of the Chairman can well be dispensed with at this time because I am the least qualified geneticist in the Committee and so far as making any remarks as to the improvement we have attained in aiding our project, I am sure this can best be left to wiser heads in genetics. But there are a few things accomplished in the past year that have been notable. I would like to say that I believe there has been a change in the attitude of the Committee that we think is all to the good. As we get to know more we appreciate the problems other people have and we can appreciate more fully the accomplishments they have made. I know personally I gained a great deal from the responsibilities of being Chairman, although the activity

that has been expended in that direction has been rather minor. But I have achieved a greater understanding of the objectives of the program and can appreciate more fully the problems that each station is faced with. With the continued activity in the Committee along the line of research we have set up, this can continue to be one of the most productive projects in the region. I would like to express my appreciation to the members of the Committee for the support they have given me. I know there was a great deal of work done on the papers. Above all, I want to express my appreciation to the Committee that has been working on the Workshop. From the program outlined, they have done an excellent piece of work. They are going to keep us busy. By the end of the Workshop we may not be so happy about it, but we are going to be kept busy, that is sure. That is all I have to say as Chairman.

Now, Mr. Grandstaff will address a few remarks to the Committee.

Mr. Grandstaff:

There has been some increase in 9-b-3 funds for W-1 this year, but you must also be aware that the regional research funds will be but a small part of the total monies required to make W-1 an effective research project. Naturally, any small increase is going to be helpful. One of the things you will be confronted with as you get additional money for your projects is how are you going to use that money to strengthen the work under way or start new projects that come up. As the Federal grant funds are increased, members of Congress who pass on those, of course, become increasingly critical of how the money is being used.

The Committee has again emphasized the need for eliminating the less essential work and putting more emphasis on the project problems of more importance, and we are going to hear more on that each year. Some criticism stems from the fact that the titles of projects are a very poor criterion, oftentimes, of the work that is being done. I think that is one thing that perhaps we need to point up in our thinking in the preparation of project outlines, the title should be descriptive of the work to be done. As I look over the titles of beef cattle breeding projects I find that many of them are identical. They are patterned after the regional project title itself. At the time these regional projects were titled that was thought to be all right, but now we are finding there is criticism as a result of using titles which do not adequately describe the project.

This past summer, a year ago, we received a request from the Chairman of the Research Committee of the American National Cattlemen's Association for suggestions as to beef cattle research projects. Actually, the Office of Experiment Stations has never supplied any detailed information on these projects. Proper steps have been taken which should result in a better understanding between this Research Committee and people engaged in research. More recently, a subcommittee has been considering just what information the Office of Experiment Stations should give out in response to inquiries for information on work at stations.

In the course of the next several months the staff will be working on the problem of summarizing data on Federal grant research in each particular area of research. Since I am going to be involved in this, too, I am anxious to have suggestions from you. The Office of Experiment Stations realizes if any summary is to be of value it must be useful to the project leaders.

Very hurriedly I brought together a summary of beef cattle research which includes projects supported from Federal funds and includes only a listing of the projects under the classification "beef cattle breeding". Please take a look at these and give me the benefit of your ideas.

Last year a suggestion was turned in in regard to the establishment of a committee on animal physiology. That was included in the recommendation of this W-1 committee that the Agricultural Board consider the establishment of animal physiology studies.

I understand some consideration has been given to the revision of the outline of W-1, which dates back quite a number of years and the work has developed very considerably since the project was developed in 1947. The Committee of Nine would look with favor on bringing it up to date with the current status of the work and also the contributing projects which should be reviewed to see that they are in line with the new regional project outline when it is developed. Read Supplement to OES-OD-1082, June 25, 1953, through so you are familiar with it to the end. This is the working procedure set up for cooperative regional projects and is the guiding manual for regional research projects.

Dr. Wayman:

Thank you, Mr. Grandstaff. We will now hear from Dr. Wheeler.

Dr. Wheeler:

Inasmuch as you have covered one point I think was very obvious to the Committee, namely, the situation with respect to the general tone of research as well as the understanding that I think we all gained from working along on these problems, I am not going to touch on that, nor am I going to repeat what Jim has said regarding the need from time to time of looking at the project. I can report from the Committee of Nine on that and simply say "Amen" to what Jim has said, that the project outline is due for some review. You all appreciate that from the standpoint of this regional project as well as the contributing projects.

I want to touch on the financial expectations of W-1. In the first place, I want to correct an impression. The project was not increased. In fact, as you were notified, there was a percentage reduction in all Western projects to provide a fund for interregional project support which amounts to \$1,000 in the case of W-1, which, therefore, reduces last year's total of \$82,000 to \$81,000. So, in effect, W-1 goes along at practically the same rate.

As you noted in the communication I sent you last spring, you were asked to express your recommendations as to allocations by states of the \$81,000 which was set up for the W-1 project. I explained by letter how I arrived at an allocation for the states. It increased some state allocations, decreased others, which was a more or less arbitrary or almost an empirical approach. I could have spent many hours putting together a more logical approach, but after so much pencil pushing you come out about the same anyway. If we had taken the average of the recommendations it would have been unreliable because there were some great deviations from the mean. So, I arrived at it by a crude yardstick of trying to rough it off and trying to come up with something fairly equitable. Some of the states that had been receiving smaller amounts were given more, and some states having received larger amounts were penalized.

Insofar as the general outlook for W-1 is concerned, speaking from the fiscal side, if additional funds may be forthcoming for 9-b-3 regional projects they may be more inclined to consider new projects and perhaps increase support of somewhat more recently activated ones. That was not officially stated. I merely stated what seemed to be their reaction. Some questions have been asked as to whether I consider W-1 funds frozen. Not of necessity. With a limited amount of new money it may well be the Directors will take the view that it is advisable to consider new projects rather than putting more money on the W-1 project. Livestock projects activated were W-34, Range Nutrition, which was activated in the amount of \$50,000 and eight or nine states participating; also, Internal Parasites of Ruminants, W-35, \$35,000. Last year the Vibriosis in Sheep project was activated, \$25,000. The percentage of money in the Western Region allotted for non-marketing livestock research is roughly 29 percent. New money allotted to livestock research was about equal to other areas.

There was a residue of \$200 in travel funds. I took it upon myself to allot such as could be used to the New Mexico station. This means that three stations have received some residue from travel funds in the past two years. I would suggest that as small residues accrue we consider informing stations of them late in the year and ask them to indicate to me how they might utilize those funds in connection with their W-1 projects. Blackwell has turned in a bill for \$180. Last year we had two stations sharing in that jackpot. I presume we will continue to have these small amounts to allot.

Are there any questions with respect to the allotments?

Dr. Kidwell:

Would you say the allocation of approximately one-half of the new money is going in the right direction?

Dr. Wheeler:

A year ago at Las Cruces they made quite a drive to see that the non-marketing funds would head in that direction. We accomplished that with our initiation of two new projects. I think I expressed my view last night at Laramie that these projects are pretty well pinpointed and definitely stated they will receive consideration. As to what proportion may be expected if we were to receive an additional increment in the 9-b-3 funds, I know other groups are aggressive in developing additional projects. I had taken the attitude that they were waiting for someone to hand it to them and it had not jelled very well, but in the past two years it has thickened very much. But we cannot play one group off against another.

I want to express my appreciation for the opportunity to sit in on the reports from W-1. Good progress is being made and I hope to take back a good report in July.

Dr. Wayman:

We will hear from Dr. Clark, our Coordinator.

Dr. Clark mentioned the cooperation with state stations on data analysis by IBM methods through cooperation with the Air Force Finance Center at Denver, and Dr. Shelby's assistance. He pointed out how we had effectively speeded up research contributions, and cited the list of publications from

W-1 being recognized as the most extensive list that had come from any regional project. He also spoke of the preparation of the Workshop program and the efforts that had gone into making sure that this would be a worthwhile W-1 effort. He expressed appreciation of the opportunity to again become directly acquainted with the work of each station through visits made to each station during the year. He hoped that we would be able to get several stations going very soon with in vivo body composition research on known genetic material and that the W-1 project would continue to grow and not be stalled at its present level. He cited how one of the Western states in particular had very materially increased its support to W-1 during the year and that two others were maturing plans to increase their breeding research programs.

Dr. Wayman:

Thank you, Dr. Clark. We appreciate your remarks. We will now hear from Dr. Byerly.

Dr. Byerly:

First of all, it is a pleasure to me to see the development of the cooperative project with which the Denver office has been able to help. Cooperation is a thing that must be voluntary or not be useful. I think this work is successful. I think the Workshop will be successful. I congratulate Drs. Clark and Shelby and those of you working with them.

I think you all know our intentions to move Dr. Shelby to the Denver office, and for the present it is the intention to keep him on this type of work.

One thing is how to get men good enough to serve as coordinators without making those men entirely pencil pushers. Something more than a year ago it was decided we would add to the research strength of the coordinator's office. We are spending on beef cattle research about 18 percent of the total Branch budget. That is spent at the Federally-owned stations and in cooperation with the states.

There have been a lot of changes this year. Hugh McPhee retired June 30. Ollie Reed is retiring. Louis Madsen resigned to become Director of the Institute of Agricultural Sciences at Washington State College. Arizona hired Carl Roubicek. I cannot officially say to you that Everett Warwick will come in to take Dr. Madsen's place. I can only say I have recommended it.

We plan, of course, when Dr. Shelby leaves Miles City, that Shelby will be replaced by a man recommended by Dr. Clark and Mr. Quesenberry. We hope to hire a man who will work at Beltsville in cooperation with our stations on the problem of carcass evaluation in the field of genetic and nutritional background.

I have been very much interested in the concern you have had with these problems of fundamental research. One remark was made about the broad base of W-1. It seems that the activation of new projects will require the orientation of the projects among themselves. I raised the question of the relationship of W-1 with W-34. There might be an effective relationship worked out that would be mutually beneficial with animals of known genotype.

Meeting adjourned.

At 7:30 P.M., a meeting of the Committee with Extension personnel and visitors was held in the Student Union.

Dr. Wayman:

An invitation is extended to the Extension people to meet with the W-1 Technical Committee on July 19, 20, and 21, 1956, at Davis, California, to be present at all sessions with the exception of the business meeting. We very much regret that there were not more Extension people at the morning meeting when the reports were presented, but I realize you had your own group meetings going on.

We will now hear from Dr. Clark, the man who knows most about the W-1 project.

Dr. Clark:

On several occasions during the life of W-1 I have reviewed the development of this the first regional project on beef cattle improvement through research. The dates on which specific steps were taken are outlined in the first page of the July 1, 1952, Annual Report of W-1.

In 1945 a group of Northern Great Plains states meeting at the U. S. Range Livestock Experiment Station, Miles City, Montana, agreed to work together on a regional program of beef cattle research and signed an appropriate Memorandum of Understanding. This was later revised when the Research and Marketing Act was passed in 1946, and led to the initial W-1 project (A.H. 1.45) which was approved July 7, 1947, with fifteen states, namely, Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oregon, South Dakota, Utah, Washington, and Wyoming, cooperating with the United States Department of Agriculture.

The objectives as stated were:

1. To develop inbred lines of beef cattle that will be useful in the improvement of such characteristics as rate of gain, economy of gain, carcass quality, fertility, and longevity.
2. To develop effective breeding techniques for improving the productiveness of beef cattle.
3. To investigate the productiveness of existing lines of beef cattle.

Now that the project has been in operation for approximately the equivalent of two generations in beef cattle it is pertinent to ask the question, "Have we accomplished any one or all of these objectives?"

Objective 1.

A number of lines within the standard breeds have been developed. In fact, each station within the region has several lines under study. A sizable body of data has been accumulated on the several phases of this first objective. Some of these data are being studied on a current basis and have contributed to research knowledge in the field of performance testing and a number of states and breeders are using this information in field extension programs. For the most part, we still know very little as to the

real usefulness of these lines in improving beef cattle in general. To tackle this phase in adequate fashion will demand more personnel and facilities than are now available. Stations differ greatly in their attitudes toward field testing and whether the lines that have been developed should be distributed. Some of the lines clearly represent the "upper crust" of the breeds with reference to true productivity. They are not necessarily the prettiest cattle. Some of the lines carry serious defects that should not be disseminated. This material is being used in fundamental studies pointed toward the development of sound recommendations to industry on how to get rid of these defects.

Objective 2.

The accumulation of Record of Performance data and sound genetic information particularly in the field of heritability estimates and inheritance of deleterious characteristics since W-1 was started has strengthened our position. Appropriate estimates of progress that can be expected under specified breeding management procedures can now be developed.

Objective 3.

While a degree of accomplishment can be cited under this objective, we are not satisfied with the adequacy of present sampling. It is not easy of solution. We soon found out the physical limitations of even the current facilities, which while admittedly vastly superior to what were available when the project was started, are insufficient for a growing program. In a few cases we have utilized private herds for test purposes. One that comes to mind was established this summer on the F. R. Carpenter ranch at Hayden, Colorado, where we are testing U. S. Range Livestock Experiment Station bulls against bulls drawn from the Crowe Ranch at Millville, California, which is one of the cooperating herds under the University of California Extension Service improvement program.

Therefore, in concluding my remarks, I can say that we have accomplished a few things under our research program that we set out to do. As is true of all research, new avenues and facets develop as we progress. In this respect we are mindful of the fact that Extension serves as the listening post of the Land Grant College system. We have enjoyed the cooperation of the Extension personnel in bringing problems to us, and in assisting us in sponsoring field cooperation and thereby helping to solve some of our problems and speed up the testing of procedures under industry conditions.

As our Chairman indicated, you will be most welcome if you care to attend our meeting in July, 1956, at Davis, California.

Dr. Wayman:

Thank you very much, Dr. Clark. We all appreciate the remarks you have made.

In a program of this type where we are trying to get the W-1 project objectives over to the Extension personnel we would be remiss unless we had a discussion from one of the state members of the Technical Committee. We will call upon Dr. Ralph Bogart to tell us about taking the research findings to the ranch.

Taking Research to the Ranch

By Ralph Bogart
Oregon State College
Corvallis, Oregon

If our research is to have maximum practical importance, it must be successfully put into effect by the farmers and ranchers. There is also value in getting research findings to the agricultural producers because they will be more willing to support research if they feel that a close relationship exists between them and their research workers.

There are several methods of taking research to the rancher. The research worker may publish material which is available to the rancher and readable by him. The research worker may work directly with the rancher in putting certain material into effect as a demonstration. In Oregon, we prefer to work closely with the extension service as the means of carrying research to the ranch. This may be done by supplying information to the extension workers for their use either as written material or by discussions with them. Sometimes it is best for the research workers and the extension people to work as a team.

I am going to describe some of the ways Oregon research is being taken to the ranch, not because I think these are the best or only ways for doing this job but because I am acquainted with these methods and wish to present them to you for what they are worth.

1. Joint publication by research and extension personnel. I want to commend this method very much because the research worker can supply the material and see that the ideas presented are sound. At the same time, the extension worker can make the material understandable to ranch people. He can also add to the soundness of recommendation because he appreciates what can and what cannot be done on the ranch. For example, all of us, the research worker and the extension worker, agree that individual feeding would be desirable so that records on feed efficiency could be used in selection. However, the insistence on individual feeding might prevent a rancher from doing any production testing. Since rate of gain and feed efficiency are so closely related, a rancher can improve his cattle for feed efficiency by selecting the more rapidly gaining animals.

One publication has been issued by Oregon under joint research and extension authorship, "Production Testing of Beef Cattle." This publication illustrates the advantages of research and extension personnel working together. It is sound in its recommendations and is written in simple style which makes reading easy. The procedures are simplified and "spelled out" so that one would have no difficulty in setting up a program on the ranch when this publication is used as a guide.

2. The official report of progress from the Oregon Agricultural Experiment Station has been changed to a Quarterly from an Annual Progress Report. The material reported in the Quarterly is edited in such a way as to make it readable by ranchers. The beef cattle improvement research has been reported in this way and has reached additional people through this medium.

3. Joint research and extension sponsored improvement program: The bull testing program which was started at the Gilliam County fair grounds was done by the breeders themselves with guidance by extension and research workers at Oregon. Several very important things developed with this program. The breeders found that each of them had good doing and fair doing cattle. No one breeder had all the good doing cattle. It became evident that most of the breeders could make great strides in improving their herds without the necessity of purchasing breeding stock from other herds. In other words, it is a matter of locating and keeping the good animals of the herd for breeding. This naturally led to each rancher setting up his own improvement program on his ranch, which is perhaps the most effective way for ranchers to improve their cattle. A great deal of interest in the entire north-west was focused on beef cattle improvement as a result of the Gilliam County work. Several other units similar to this have been started in Oregon, other western states, and in Canada.

Each bull was indexed by the research workers, using the records on gains, feed efficiency and score so that the breeders knew which bulls had the greatest overall merit. Extension and research personnel discussed with the ranchers methods for improvement at the ranch as well as by the cooperative bull testing program.

One of the main advantages that the Gilliam County program had was the fact that the breeders did this for themselves. It caused them to organize and to meet frequently. During these meetings a great deal of discussion took place on beef cattle improvement. Discussion of this mutually interesting problem by breeders, extension workers and researchers was one of the most effective methods of getting the program across that one can find. The fact that the breeders did this for themselves was a help because of greater interest in the program. It also prevented tying up research facilities to do service work for the farmer.

One concept which was developed by discussions of the Extension and Research workers with the ranchers was the importance of cow selection on the ranch as well as the use of production tested bulls with a good record. Several of the ranchers are now considering cow productivity in culling their herds. This rounds out the selection program because such traits as fertility and suckling ability are given consideration along with rate and efficiency of gains and conformation.

4. Schools and field days for ranchers jointly sponsored by research and extension workers:

Instead of holding all field days and schools at Corvallis, several of these are held in various areas of the state. Each of the branch stations has one or more field days each year. These field days are set up to show the ranchers what is being done at some particular station and are usually held at the termination of a research study so that the animals and the results are available for the field day. Oregon has four branch stations which work on beef cattle research, some of which is concerned with improvement through breeding.

Oregon State College has field days several times each year when ranchers are told about the research being conducted. It has always

been the policy to tie the extension workers into these programs because of their value in getting this material across to the ranchers.

Several schools are held in various areas of the state, and they are generally conducted by extension and research workers. The programs vary from rather fundamental breeding principles to applications for subject matter. We find that many of the ranchers want to know more about genetic theory, as well as how to use genetic principles in livestock improvement.

We find that many ideas can be put across by researchers visiting at ranches when they are in an area to help conduct a school for the ranchers. It is not suggested that the research worker spend a great portion of his time on ranches but that time that one might otherwise not use could well be spent on some ranches when one is in the area for other purposes.

5. Discussions and Planning:

The extension and research workers do a great deal of friendly discussing. Each year we have an "all staff" meeting when all workers meet in Corvallis. This meeting lasts a week and it provides an opportunity for research and extension staffs to have discussions and to do planning for future programs. Extension workers are called in for their views on new research, i.e., what seem to be the pressing problems in the field. Likewise, research workers are used in planning future extension programs. It might be stated that the publication, "Production Testing of Beef Cattle", was prepared at the request made during one of these discussion periods.

There is a possibility of research on ranches; particularly, when one is interested in demonstration type of research or in field application of research. Oregon anticipates the appointment of a joint extension-research worker for conducting this type of work. Prof. Neale of New Mexico has demonstrated the effectiveness of this kind of work in his sheep improvement program. In addition to his being of great help to the sheep producers, he has obtained a lot of useful data.

6. Services to farmers:

The research and extension workers provide two services to Oregon ranchers related to beef cattle improvement.

- a. The profiling of animals. The extension workers take profiles of animals at the request of the rancher. These profiles are keyed out by the research workers and a report is made so that the extension worker can give the results to the rancher.
- b. Extension workers help the rancher set up a record-keeping system. After records are obtained by the rancher, he can send them in and the research worker will index his animals so that selections can be made on the basis of overall merit.

Summary:

I shall give my own opinions on taking research to the ranch by saying that I think this is most effectively done through close cooperation between the extension and the research staffs. I feel that the extension worker can do more effective work with farmers than the researcher. He needs the material from the researcher for an effective extension program. Before either group is critical of the other, a sincere effort should be made to help those in the other branch. Each research worker should do all he can to help the extension worker to know what is going on and to provide him with the latest results. He should do all he can to make it possible for the extension worker to apply the results. Research workers should be certain about their work before it goes to the ranchers, as they don't like to risk their dollars on untested ideas. But, one should not be afraid to put reasonably sound material across to extension workers for them to take to the ranchers. Careful interpretation of research results worked out jointly between research and extension personnel may help reduce problems here. Ranchers know that every principle won't apply on every ranch every year. Often, ranchers are keenly interested in "what is going on," even if results of practical value are not immediately available.

By close cooperation with extension workers, several methods can be used for taking research to the ranch:

- a. Publications
- b. Schools and field days
- c. Programs on the ranch
- d. Demonstrations
- e. Cooperative programs
- f. Services to farmers

Dr. Wayman:

Thank you very much, Ralph.

Now we come to the third phase--the problem of research and its application to the problems we have at hand. We would like to have the Extension man's viewpoint on this. We are going to call on Mr. Ivan Watson, of New Mexico, who was invited to speak to us on the application of research findings.

Mr. Watson:

It is an honor to be here. Ever since I was asked to speak I have wondered why. We had a meeting of our group of Extension specialists today, and while we would have enjoyed meeting with the W-1 Committee I think we felt the day we spent together discussing livestock problems and things so closely related to the beef cattle work you are doing under W-1 was profitable. We all received a great deal of benefit from this exchange of ideas among ourselves. I hope, though, in future years we can meet with the W-1 Committee and we will then discuss these problems from your viewpoint, also.

The title given me, "The Application of Research Findings from W-1," reminds me of the town of Los Lunas, south of Albuquerque. The Chamber of Commerce of this town wanted to do something so they published a pamphlet on the front page of which was a circle and around the circle thirteen people and in the center a guitar--the title, "Thirteen People and a Guitar," the Chamber of Commerce's idea of how to enjoy life. Maybe I am the guitar on the program tonight.

New Mexico has not done anything spectacular. Any success we have had I would like to attribute a great amount of that success to the fine people we have on the Experiment Station and to Prof. Knox and Prof. Neale. We have had some very excellent men come to us--Dr. Blackwell, Dr. Koger before, followed by Dr. Ralph Durham. These people have done a great job in their animal breeding work. We have always had a very close working relationship with our research people. I know our cattle and sheep want the same research future--the research findings. Dr. Bogart took it from one angle, I shall take it from the other.

We work closely with the research people. If we are stuck on something, we go to the men concerned. With all due respect to any previous Extension personnel, our Experiment Station people in New Mexico prior to 1940 had little to say when I went to New Mexico in 1943. We did have the sheep program started, but for the first three or four years in attempting to organize in the state some type of cattle program with our cattle people I found it difficult to interest some of our older cattle people in a herd improvement program or program that might be concerned with the economics of their ranching operations. Within the past seven or eight years that situation has changed so rapidly that at the present time I think we could sell our cattle and sheep men most anything in the way of a cattle or sheep program in connection with their ranching. There are several reasons for that. I want to give credit to Prof. Knox and Prof. Neale. Some of the others who were opposing us either have retired or passed on. We do have as replacements quite a young group of ranching or stock people, mostly college graduates. They are quick to catch on, to understand, to see the light.

In about 1945 we were able to convince our cattle growers' association after five or six years with our wool growers' association they should have something in the way of material on display at their conventions. We did try to supply material that would interest them. We were not able to participate except on Committees, but had no definite cattle program until 1948. This has improved so much that at our annual cattlemen's program they say we must put on at least a half-day school and usually the subject matter we have been using in the past four or five years is the subject matter stated in W-1 by Dr. Clark.

I know what the feeling was thirty years ago among our cattlemen. The heifers used as replacements were the lightest--ones they could not sell, that would not sell, or would give them the lowest returns. They would make bulls out of those calves that would not make good steers. One of our outstanding cattlemen made the following statement: "You talk about marketing these dry cows. This year's dry cows will bring my calf crop next year." He said they would make a fifty percent calf crop. We do not have that kind of thing anymore. We have the things that have been mentioned here--how to improve calf weights, percentage of calf crop. They are thinking of the span of life of the breeding cow--will she breed regularly, how long, what number of years? Dr. Bogart gave you some very good suggestions and rather than repeat I will say, "Amen", to them. We are doing much the same thing. There is a good relationship between the research and Extension people. We use about every available means to contact our people through our County Agents, radio, newspaper articles, Field Days, Feeders' Days, Ranch Days. I think possibly the one thing that has done most to help sell beef cattle improvement in New Mexico came around in this manner: When sheep improvement work started in 1946 our wool growers felt they should have some objective for being other than just an organization for political reasons. They told the members of the college staff they would like to sponsor the sheep-herd improvement program. I believe that backing of the State organization helped to convince some sheep producers who would never have cooperated in a herd improvement program. So, when we got our beef cattle herd improvement program fairly well organized we went to the cattlemen's organization, and we have a very strong organization--about 6,000 members, about 90 percent of all cattle growers in New Mexico are members of the Association. We went to the Association and asked would they care to sponsor a beef cattle herd improvement program. At that time we had a president of the Association very much interested in the program. We got the backing of our state cattle growers' association. In the first year the officials of the cattle growers' association appointed a new committee in the association with full powers similar to any other committee in the association. George Ellis was Chairman of the committee, a former Extension Animal Husbandman who had worked with Prof. Neale on the sheep program, an enthusiastic person, and he certainly did a good job with his members in pushing the work.

Practically all states have some sort of organization either on state or county level. Through them you can get something going, and you can make them feel responsible. If you want them to work, don't take the credit for yourself. Give credit to the grower or stockman. Make him feel whatever progress has been made he is responsible for.

A word about our beef cattle improvement program. It follows pretty much what is being done in your work. Record of production, assistance in classification to know the significant matings or whatever you like. The standards you use depend on you and the rancher. We use weight for age,

weight at weaning, and grade. I used to think I could grade a cow herd and get the top cows, next grade, and next bunch. If you use the calf weight produced to determine whether she is best cow or second best you may fool yourself on the grading basis. We top out whatever percent we want in our top herd of heifers--gather up the top fifty percent. We follow the same plan in grading bulls unless we do have some production record on them. We have tried to identify some of the bulls by some of the calf markings. In the top bulls it works fairly well in some instances. The objective is to set up a top herd of cattle that will be bred to the best bulls that rancher has. Out of the top half of his herd we expect he will select at least 90 percent of his heifer calves for replacement. That, roughly, is the plan we follow in our beef cattle improvement.

We do have a program for registered cattle and a program for commercial cattle. We have several classes or several steps. It is done mostly by weighing with registered cattle, although we do some weighing in the commercial herds. We do try to use everything that has been proved by W-1, and I must say W-1 has given us some wonderful ammunition.

There is one other point I want to make about your program. I want to make it perfectly clear that while it may have three or four phases it must be feasible, it must be adaptable to the ranch. Do one part, or as much as you can. For that reason I believe our stock people have been responsive to what we have to offer. They feel we are offering something which they can apply to their particular set-up.

Dr. Wayman:

Thank you, Mr. Watson, for your remarks.

We have with us a well known visitor in the person of J. P. Smith, Superintendent of the PanTech Farms at Amarillo. We would like to have some remarks from you, Mr. Smith, regarding beef cattle breeding research and its application in Texas.

Mr. Smith:

We decided to test each man's bulls in one pen. There was some discussion as to whether to individually feed them or how to feed them. The method of testing is in this little book for our 1955-56 test. We may be doing it wrong, but the breeders like the rules. We have copied a lot of the New Mexico work. We are disciples of Mr. Ellis at Bell Ranch.

The cattle offered through our Record of Performance sale were good but not very pretty. They averaged \$40 more than cattle offered at the Amarillo sale.

I want to express my appreciation to Dr. Clark for giving us a tremendous lift in the development of our program.

I bring greetings from Dean Stangel, Dr. Patterson, and Dr. Miller.

You don't know how much enthusiasm we have about this. I wish you would all come to see us. I am not scientific, not a technically trained person. In our ROP sales ability to gain brought 41 cents a pound in 1953, 81 cents a pound in 1954, \$2.51 in 1955. We had some people in there buying and there was a lot of eyebrow raising about the ability-to-gain cattle.

Breeders run the program. We do get help from the Extension people. County Agents are the best in the world to tell you how many people you will have to feed. They can tell you within 50 people. They are mighty good people to contact the breeders.

As most of you know, we did exhibit at Chicago. I think really that caused the formation of the American Beef Cattle Performance Registry Association. They asked us questions we could not answer. We came back and put them to our Group. The Association was chartered in the Sovereign State of Texas. It has as members some of the finest breeders in Texas. It is a separate thing from our work. However, we do have overlapping cooperators.

I think there is no use arguing about ability to gain. If you want to make a friend and help him make some money, tell him to get a bull that will produce up to three pounds per day.

Any time we can do anything to help the W-1 program we will be happy to do it.

Dr. Wayman:

Thank you, Mr. Smith. Does anyone else have any comments?

Mr. Pattengale:

We have sat here this evening and talked about beef cattle improvement. All will agree that it is a thing that is sadly needed. At the same time, I have not heard this evening one dissenting voice that I heard all day today when the same thing came up for discussion among the Extension Livestock Specialists who work with the ranchers and who in essence are your salesmen.

Let us look at this ROP program from the standpoint of us men who have to go out in the field and put it into operation. It is going on in California, Oregon, Washington, Texas. Yet no one is agreed on certain essential features that are involved. I brought up a question today. A remark was made by one of the Livestock Specialists, "These boys talk about rate of gain, rate of gain per day is essential--weight for age." That we all agree. But I say this, if you just want rate of gain per day get us a Holstein bull and you can get it. We have to get quality!! I read Paul Swaffer's article. The longer I read, the madder I got. He was right about rate of gain--the thing you have been talking about, the thing you have been working on. You have not sold him on it! You have given him rate of gain, weight for age, nothing about quality. He was perturbed. I do not blame him. I would probably have been in the same state of mind if I had been in his place.

The thing was brought up today in a meeting--surely somewhere along the line our research workers can get together. For example, quality--how do we measure for quality? We grade cattle--fat cattle grade Prime, etc. Same way with our feeder cattle. Then get into your breeding cattle. We have various ways of measuring quality. California uses a numerical system: 1+ bull 1, or 1-. We have translated it here in the mountain states. We use letter grades: A+ = West Coast's 1+ bull, etc. We have one system of grading from the standpoint of quality. Several other states have developed systems of grading. I do not think anyone questions that a

choice feeder calf in the State of Washington is very different from one in the State of Virginia. Why should a top herd bull in the State of Oregon be different from a top herd bull in the State of Colorado?

We are talking about going into an ROP program, but we had better get some thinking straightened out before we go on. We have an ROP program in the State of Colorado. Can we as Extension Service men go out here in our state and tell our cooperators we are going to use such and such a correction factor on a two-year-old heifer, or a five-year-old cow? Can we use those correction factors and feel within ourselves that they are right? I have asked research workers, but all I get is casting of eyes up to the ceiling and down to the floor. Before we get into this thing we had all better be agreed upon something. It is important to you, it is important to me.

Dr. Byerly:

I think it is said that in a discussion it is well to start by establishing some basis of agreement. If we have a program of ROP to sell, I find these points of agreement:

1. Rate of feed lot gain is important, a significant factor in profitable beef production.
2. Some Holsteins will gain as well as some of our better beef cattle, I am sure. Some Holsteins carry an inordinate amount of flesh, and some beef cattle very little flesh. I am sure we can agree that quality is an economic factor in the production of beef.
3. With respect to quality we can say to a breeder, you choose the kind and quality of cattle you prefer to breed that you feel fits your market and within that kind of cattle you select we can improve rate of gain.

Dr. Wayman:

I have been thinking about a talk by Dr. Alex Wood of the University of British Columbia three years ago at the W-1 meeting. Dr. Wood defined some of the things we have been talking about today and tonight, the economic characteristics we should seek for in beef cattle--type of carcass the market wants was one of the most important. We should keep those in mind in regard to our beef cattle research program.

We have discussed many of the problems of carrying research findings to the people. By working closely with your Extension Livestock Specialist you can make up your mind as to how you want to do this. As long as a research man cannot give you a definite answer he is going to give you an indefinite answer. So, you Livestock Specialists, please keep in mind the research man has to keep his integrity and cannot come out and give you a black and white answer when he has not the answer. That is the reason for equivocation at times.

Dr. Byerly introduced Mr. Charles Bell, U. S. D. A. Livestock Specialist.

Mr. Bell:

I am fairly new on the job. I am very much interested in this discussion this evening. We had a discussion today on the practical application of these problems. I can see a sincere desire on the part of the technical workers to improve the cattle industry, and on the other hand a sincere desire on the part of the Livestock Specialists to work with you. If this program develops we will have to combine the skill and knowledge of you men in research with our Extension programs.

Dr. Wayman:

I hope you Extension people have gathered that we are sincerely interested in having you carry to the cattlemen and ranchers the work that has been done in research.

Dr. Sierk:

I do not have a lot to say, but since the matter of grading has been brought up I think this statement will stand, that grading of beef cattle, particularly on the ranch, started in the State of Idaho with Mr. Rinehart. I am not going to try to point out what may have been gained in Idaho. I have discussed this on several occasions with Mr. Pattengale. I think there is one thing we should keep in mind and I am sure when Pat was talking about grading he did not have in mind this grade on quality only. There are many other factors that are taken into consideration in addition to grading.

Dr. Clark:

I would recommend that those of you who have not read "Are We Overboard on Eye Appeal?" read that article in the Record Stockman. In a large measure it places discussions such as we have had tonight in the proper setting.

Dr. Bogart:

Because some people might get the idea that a lot of things at the different stations are different, I would like to report that correction factors for adjusting weaning weight to a common-age basis were almost identical at Colorado, New Mexico, and Oregon, for range calves in the arid regions. The greatest differences between any of these three stations was only .04 of a pound of gain per day. This showed clearly that under these conditions calves are gaining at about the same rate and that correction factors of any of the stations would be applicable to any of the others.

Dr. Clark:

Ralph, I would appreciate your restating to this meeting your reply to the misconception that selection for fast rate of gain results in rangy, upstanding, poor-type cattle.

Dr. Bogart:

If selection for rapid rate of gain results in developing cattle which are upstanding and off-type, then one must admit to conversely select for block conformation and ideal type would automatically result in very slow rates of gain. Since our studies as well as many others indicate that neither

poor type results from increased rate of gain nor poor rates of gain result from selecting for good type and conformation, I am of the opinion that there is no relationship between the two and that we can have, through selection, calves that are good in both characteristics.

Dr. Wayman:

The thought Prof. Knox left with us last year was, "A good bull can improve a herd, but an idea can improve an industry. Let us keep our thoughts on ideas." I think he expressed the feeling of all of those who participated on our panel tonight.

Meeting adjourned.

A final session of the Technical Committee was called by the Chairman, Dr. Wayman, at 2:30 P.M., July 14.

Dr. Wayman:

We will have the report from the Resolutions Committee from the Chairman, Dr. Sierk.

Dr. Sierk:

We have the following resolution to present:

RESOLVED, That the W-1 Technical Committee go on record expressing its appreciation to the host institution, the Colorado Agricultural and Mechanical College, for the facilities and hospitality that have been extended to the members of the Committee and visitors during the 1955 annual meeting.

Dr. Bogart:

I move that the resolution be accepted.

Dr. Blackwell:

Second.

Dr. Bogart:

May we include authorization to write a letter to this effect?

Dr. Wayman:

The motion has been made and seconded that the resolution be accepted, including authorization to write a letter to the host institution. Motion carried.

The other bit of business is related to confirming our Chairman for next year. It is set up that the Chairmanship rotate, but I am sure Dr. Dierk would appreciate a confirming motion.

Dr. Gregory:

I move that Dr. Sierk become the next Chairman of the W-1 Technical Committee.

Motion was seconded and carried.

Dr. Clark:

I will send you all the suitable references bearing on the use of tritium and deuterium oxide and other techniques that I have been watching in the field of body composition. Two stations, before we meet again, will at least take the beginning steps to attempt this technique, and we as a coordinating office vitally interested in this phase of the research program will try to foster that work.

Dr. Bogart:

I have one thing I want to mention--the one thing we want on record is saying that the dissemination of our publications is to be to all Technical Committee members, as has been done in the past. I would like to call it to the attention and to ask all of the members to keep in mind that anything that is put in print we sent out to all other members.

Dr. Wayman:

That will become a part of the minutes without a motion.

Dr. Byerly:

It would be helpful to me if I could be included on that list.

Mr. Grandstaff:

And I. We are often requested through the year for information, and it is convenient to have the publications available.

Dr. Sierk:

I would like to say that the past year has been a very fruitful one, that is quite obvious.

While it has generally been understood in the past, I would like to move that in addition to his other duties our Coordinator be considered Secretary of the W-1 Technical Committee.

Dr. Gregory:

Second.

Motion passed.

Dr. Kidwell:

Might we also make him a member of the subcommittees, so that he might disseminate any information.

Dr. Wayman:

In his role as Secretary of the Committee, that would be understood.

Dr. Clark:

While we are together, might we have some expression of opinion on the subject of the work that Carl Roubicek has started in the review of literature on dwarfism. We would suggest that the Dwarfism Literature Review be designated as a regional publication. I would like very much to really sense the view of the Committee in addition to the views that have been expressed to me individually by research workers on this type of approach.

Dr. Gregory:

The Dwarfism Literature Review was a very worthwhile piece of work and I know anyone interested in dwarfism will find it very helpful. It is going to have to be revised continually for some time because other papers will come out. I think it should be put into such a form that it could be distributed more widely. It should have the highest recommendation and there should be more than the limited number of copies now available.

Dr. Byerly:

I am in favor of Dr. Clark's suggestion. There are certain formalities which would have to be observed if it were to be given a number and published as a regional publication. I believe it would have to have the formal stamp of approval by the Directors and the Regional Administrative Adviser, and the Information Office in the Department. There are established series in the Branch and in the ARS. I am not so familiar with those in regional groups.

Dr. Clark:

We did not have that in mind at the beginning. We had it in mind purely as a working tool for the W-1 Committee. But now as we go into this later suggestion that it be indexed into a series I don't know whether the rules of protocol may slow up the actual use and getting out of the material on a timely basis.

Dr. Byerly:

It may have some advantage of finding wider dissemination and additional funds. It will have the disadvantage of time consumed in clearance.

Mr. Grandstaff:

9-b-3 funds could be used.

Dr. Byerly:

Or perhaps the surplus travel money could be utilized.

Dr. Clark:

That is a good suggestion. Those of you who write know that a literature review that amounts to very much demands a lot of time--far beyond forty hours a week--and that is what went into that manual which was intended purely for the use of W-1 and interested research workers.

Dr. Wayman:

There are publications put out by stations that are cooperative reports and I have been wondering if those should not be included in the regional series as well. Wherever they are put out as a cooperative report they should be put out under a regional series number.

Dr. Stonaker:

As I understand it the regional publications would be put out from public funds.

Mr. Grandstaff:

Usually, a station's fund is augmented.

Mr. Bennett:

I would like to express the appreciation of the Utah station for this publication on dwarfism. All are interested in the subject but not any of us have gone to the trouble of preparing a literature review.

I would like to move we leave this up to Dr. Clark, putting this out in a form for greatest distribution. There are other areas, other countries, even, interested in this problem.

Dr. Gregory:

Second.

Dr. Wayman:

Might I suggest that this be an Executive Committee responsibility, with Dr. Clark in charge.

The motion has been made that Dr. Clark in collaboration with the Executive Committee investigate the possibility of issuing series-numbered bulletins to include the Dwarfism Literature Review recently compiled by Dr. Roubicek and collaborate in other similar type publications to be forthcoming.

Dr. Sierk:

Would anyone care to say how soon this review might need revision? Will a revision be fairly soon?

Dr. Clark:

Roubicek, would you care to comment?

Dr. Roubicek:

All of these things are obsolete by the time they come out. I would suspect after two or not more than three years it would require a revision.

Dr. Wayman:

Are you ready for the question? Motion carried.

Dr. Stonaker:

I would like to move that the Committee express appreciation to Roubicek, Clark, and Pahnish for taking the initiative for this undertaking.

Dr. Kidwell:

Second.

Motion carried.

Dr. Kidwell:

I would like to move that the Committee express its appreciation to Dr. Roubicek for all his assistance and guidance during the period he served as Coordinator for the W-1 project.

Dr. Stonaker:

Second.

Motion carried.

Dr. Stonaker:

On behalf of the Colorado station I would like to accept your fine resolution and tell you how much we enjoyed having you here. I am sorry for any inconveniences.

Dr. Wayman:

I would like to express my appreciation to those of you who have done the work on the Technical Committee for the past year--the Committee on the Workshop, Dr. Clark for the work he has done in carrying on, and for the cooperation I have received from various other members of the Committee.

Dr. Gregory:

You are going to meet at California next year. We are developing new facilities. Just what the housing facilities will be I don't know, but I will find out the possibilities. I would advise you to get your reservations in early if you wish to stay at a motel.

Meeting adjourned.

The following subcommittees were named by Dr. C. F. Sierk, Chairman, W-1 Technical Committee 1955-56:

Carcass evaluation

Prof. F. S. Willson
Dr. P. O. Stratton
Dr. C. B. Roubicek, Chairman

Selection index

Dr. Ralph Bogart
Mr. J. R. Quesenberry
Dr. R. L. Blackwell, Chairman

Nomenclature

Mr. James A. Bennett
Dr. Oliver Wayman
Dr. J. F. Kidwell, Chairman

Gene Interaction

Dr. P. W. Gregory
Dr. M. W. Galgan
Dr. H. H. Stonaker, Chairman

